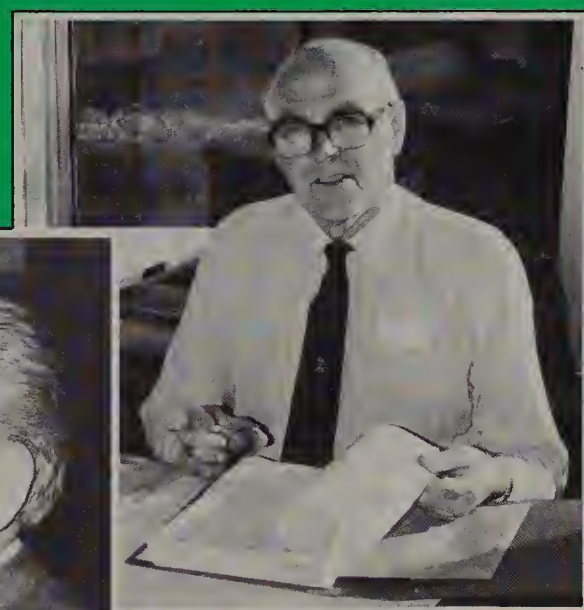


Chemistry International

The news magazine of the International Union
of Pure and Applied Chemistry (IUPAC)



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CHEMISTRY INTERNATIONAL

The news magazine of the International Union of Pure and Applied Chemistry (IUPAC)

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REPRODUCTION OF ARTICLES

Reproduction or translation of articles in this issue is encouraged, provided that it is accompanied by a reference to the original publication in *Chemistry International*, unless there is a footnote to the contrary.

Front cover: The Officers of the Union: (left to right) Prof. C. N. R. Rao, President, Prof. V. A. Koptug, Vice-President; Prof. T. S. West (top), Secretary General; Prof. A. Björkman (bottom), Treasurer.

A milestone in the history of IUPAC

This issue marks a major milestone — and some would say a turning point — in the history of IUPAC. It marks the start of the Affiliate Membership Scheme. IUPAC — that “charmed circle” of chemists — has finally opened its doors to chemists world-wide. There are many, both inside and outside of IUPAC who have doubts about the scheme. However, there can be no doubt that the overall aims of the scheme are worthy. These are to maximize the participation of chemists in the affairs of IUPAC and also to disseminate information about IUPAC, its activities and its output to a much wider audience. The extent to which these aims are achieved will depend on the support the scheme receives. The early signs are encouraging.

This magazine — and it is a magazine, not a journal — will play a key role in support of the scheme. In my first editorial (*CI*, No. 4, p. 1, 1985) I wrote that the principal aims of the magazine are:

- to be informative about IUPAC
- to be interesting and readable
- to provide a forum for the expression of views

In this issue the reader will find information about the relationship between IUPAC and industry in an article prepared by the Committee on Chemistry and Industry (COCI). Since most Affiliates will be largely unfamiliar with IUPAC it has been necessary to go over some old ground. For example, much of the material in the Who's Who of IUPAC Officers has appeared in previous issues. What is new, however, is the article “A Typical Day in the Life of Prof. C. N. R. Rao”. This is the first of a new series portraying IUPAC people at work. Hopefully, this series will help to answer the question we are always asking — how are busy and successful chemists able to find the time needed for their IUPAC work?

The Lyon General Assembly and the IUPAC Congress held in Manchester appear yet again. These are major events in the IUPAC biennial calendar and they therefore generate more material than can be covered in a single issue. As an example, we started coverage of General Assembly and Committee meetings in the previous issue and this coverage will continue into subsequent issues.

In a paper entitled “Chemistry's Cornucopia” Nobel Laureate Sir George Porter provides a readable and interesting view of the present and future role of chemistry in satisfying the needs of modern society. The paper was presented as the plenary lecture at the opening of the IUPAC Congress in Manchester. Sir George has already been involved in IUPAC's major programme on Chemical Research Applied to World Needs (CHEMRAWN), having participated in a CHEMRAWN II workshop held in Sri Lanka last year (see *CI*, No. 4, p. 21, 1985). Like many other chemists, Sir George is also concerned about the general public's “over-reaction” against “chemicals”. *Chemistry International* would welcome views on this topic both from the old “charmed circle” and the new Affiliates. Can or does IUPAC make any impact on the general public's view of chemistry, chemists and “chemicals”?

Opinions expressed here are those of the author and do not necessarily reflect the views or policy of IUPAC.

IUPAC welcomes Affiliates

Early signs indicate that the number of chemists opting to become IUPAC Affiliates will exceed original expectations. The largest contingent are from the USA where the Membership Division of the American Chemical Society predict that the final figure for IUPAC Affiliates in the USA may well be in excess of 3000. All new Affiliates are being sent a "welcoming package" which includes a letter from the President.

Last year invitations to operate the IUPAC Affiliate Membership Scheme were sent to 67 countries. These included IUPAC's member countries, observer countries and developing countries which have expressed interest in developing links with IUPAC. Guidelines on how to implement and operate the scheme have been sent to the National Adhering Organizations or Chemical Societies in all these countries.

By November last year 32 countries (see below) had indicated that they intend to implement the scheme — mostly in 1986, although some will start in 1987. The NAOs or Chemical Societies in each country are determining their own modes of operation of the scheme and are responsible for implementing and operating the scheme in their respective countries. Some are operating the scheme through the membership organizations of their Chemical Societies or Institutes of Chemistry. Others are advertising the scheme in their national chemistry journals and inviting chemists to apply.

The response from developing countries has been particularly encouraging. Full Affiliate Membership in 1986 for a nominal membership fee of US-\$1.00 has been offered to 500 young chemists in developing countries. This has been possible because of grants totalling US-\$15 000 from the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the International Council of Scientific Unions (ICSU). The invitations were sent to 35 developing countries during August last year. By November, 13 had already agreed to operate this part of the scheme. These are included in the table.

Each NAO/Chemical Society operating the scheme has been invited to nominate a person in their country to take responsibility for operating the scheme in their country and to liaise with the Affiliate Affairs Secretary at the IUPAC Secretariat in Oxford. This person is known as the National Affiliate Membership Secretary. In some countries

this is the Membership Secretary of the National Chemical Society.

Although, at the time of writing, it is too early to say exactly how many chemists throughout the world will become IUPAC Affiliates the early signs are promising. The Royal Society of Chemistry — which is operating the scheme in the UK — predict that 700 British chemists will become IUPAC Affiliates in 1986. This prediction is based on early returns of their subscription papers. Similar calculations by the Membership Division of the American Chemical Society suggest that over 3000 chemists in the United States will become IUPAC Affiliates.

All Affiliates are being sent a "welcoming package" of documents. This includes a welcoming letter from the President (see box), and a letter from the Affiliate Affairs Secretary describing the benefits of the Scheme. One of these benefits is, of course, the receipt of six issues of *Chemistry International*.

Countries operating the Affiliate Membership Scheme

Argentina	Malaysia
Australia	Netherlands
Austria	New Zealand
Brazil	Papua New Guinea
Canada	Philippines
Chile	Republic of Korea
China	South Africa
Colombia	Sri Lanka
Denmark	Sweden
Ethiopia	Switzerland
Federal Republic of Germany	Thailand
France	Turkey
Ghana	UK
India	Uruguay
Israel	USA
Japan	Venezuela

The President welcomes Affiliates

Prof. C. N. R. Rao has sent a welcoming letter to all new Affiliates. The following is the text of the letter:

Dear Affiliate,

Welcome to the IUPAC family! IUPAC has been striving hard for the past few decades to contribute to the advancement of pure and applied chemistry in several ways. For example, it has done much towards bringing uniformity in atomic weights, terminology and symbols, and providing advice to international bodies. Above all, it attempts to bring together the world's chemists. In order for IUPAC to be truly international, it would like more chemists and more countries to participate in its activities. The Affiliate Membership Scheme is a step in this direction. You will surely agree that such international efforts are necessary not only to remain scientifically alive but also to maintain sanity in this disparate world.

I am delighted that you are going to be associated with IUPAC.

With best wishes,

C. N. R. Rao
President



Maison de la Chimie Foundation Prize

The Fondation de la Maison de la Chimie has created a prize of 10 000 FF for a work of chemistry of benefit to mankind, life or nature. The prize will be awarded to one or more individuals in Autumn 1986. Applications should be submitted in English or French by a learned society or national or international scientific organization and received before 28 February this year by: Maison de la Chimie Foundation Prize Secretary, 28 rue Saint Dominique, 75007 Paris, France; Telephone (1) 4705 10 73, Telex 200 351 Chimie Paris.

Letter to The Editor

Biotechnology

Sir,

I read with interest the article by Prof. Manfred Ringfeil on "Biotechnology (not only "Bio" but also "Technology") in *CI*, No. 5, pp. 19–22, (1985). I also read the Report of the President on the state of the Union and in particular his reference to the discussions on the Commission on Biotechnology. I note that the Commission "has not yet been able to develop a strong programme in this rapidly developing field".

My connection with IUPAC is as the representative of the International Union of Biochemistry (IUB) on the Clinical Chemistry Division. My interest in biotechnology is as a biochemist and as editor of the *Journal of Applied Biochemistry*, published for IUB. As a biochemist I found Professor Ringfeil's emphasis on the technology interesting but narrow. I would agree that *one* of the key questions is whether biotechnology is capable of bringing about more profitable methods of production than the most advanced in use today. I suspect that in most cases the answer will be no. To me, a much more important question is whether biotechnology will lead to entirely novel commercial products. The answer to this question is certainly yes; the only qualifications being to what extent and how quickly.

Successes to date must include the production of human proteins such as insulin, growth hormone and interferon. The production of Factor VIII so important in the treatment of haemophilia has

been achieved but cannot yet be said to be a commercial success. Another promising field is the production of vaccines both for animal and human diseases. The vaccine against the hepatitis B virus will surely be a milestone in the conquest of a major disease, especially in Asia. The production of monoclonal antibodies and their use in the purification of proteins and in diagnosis is also encompassed by biotechnology.

As the President emphasizes, biotechnology is a multidiscipline activity involving chemical engineers, chemists, biochemists, microbiologists, geneticists, etc. Its successful exploitation will therefore involve effective collaboration between scientists and engineers with very different backgrounds. While the biochemists may be short on engineering experience the chemists and chemical engineers are often woefully ignorant of biology. In the UK this is probably because only the weaker chemistry students at University are encouraged to study biochemistry. I suggest that the future development of biotechnology depends on the creation of a new attitude by chemists towards biology in general, and I am sure that IUPAC and IUB could together play a useful role in this respect. IUB stands ready to receive suggestions.

Prof. P. N. Campbell,
Courtauld Institute of Biochemistry,
The Middlesex Hospital Medical School,
London, UK.

IUPAC people



Prof. W. Klemm

We regret to record the death of:

Prof. W. Klemm, FRG (24 October 1985) — President of IUPAC (1965–67), Bureau (1955–63), Vice-President of Inorganic Chemistry Division (1955–59), Commission on Nomenclature of Inorganic Chemistry (1959–63), Editorial Board (1959–63).

Who's who in IUPAC

In the past *Chemistry International* has regularly published pen-portraits of Division Presidents and newly elected Officers and Bureau Members. We are now extending this feature into a regular series of articles portraying some of the well-known figures in IUPAC. In this issue we start with the Officers.

The Officers

The Officers of the Union are the President, Vice-President, Secretary General and Treasurer. All are elected at regular meetings of the Council. The *President* holds office for two years and cannot be re-elected in the same capacity. He is the administrative head of the Union and presides at meetings of the Council, Bureau and Executive Committee. At each regular meeting of the Council he also submits a report on the general state of the Union. The *Vice-President*, designated as President-Elect, becomes President of the Union at the close of the next regular Council meeting. This

will be held in Boston, USA in August 1987. The Vice-President may be required to assume the President's responsibilities should the President be unable to perform the functions of that office. The *Secretary General* is responsible for keeping the records of the Union and for the administration of the Secretariat. The *Treasurer* is responsible for the accounts of the Union and prepares a budget for approval of the Bureau and the Council. He also has the final word in handling the investment and the custody of the funds of the Union. Both the Treasurer and the Secretary General are elected for four years and eligible for re-election for up to four more years only.

President:
Prof. C. N. R. Rao, India (1985–87)

Prof. C. N. R. Rao, born in June 1934, is currently Director of the Indian Institute of Science, Bangalore, as well as Chairman of its Solid State and Structural Chemistry Unit and Materials Research Laboratory. Earlier he has been Head of the Department of Chemistry, Indian Institute of Technology, Kanpur (later Dean of Research) and Visiting Professor at Purdue University (USA), Oxford University (UK), Cambridge University (UK), and La Trobe University (Australia).



◀ Prof. C. N. Rao

Prof. Rao's research interests are in the fields of solid state chemistry, surface science, spectroscopy and molecular structure. For his contributions to these subjects Prof. Rao has been awarded numerous honours by scientific organizations in India as well as by several prominent countries. He is a Fellow of the Indian Academy of Sciences and The Indian National Science Academy, and of The Royal Society, UK; he is a Foreign Member of the Slovenian Academy of Sciences, Yugoslavia, and a Founding Member of the Afralasian Academy of Sciences. He took over as President of the Indian National Science Academy in January 1985. Prof. Rao also received the highest national honour (Padma Vibhushana) in the 1985 Republic Day honours list in India. This was conferred on him by the President of India.

Prof. Rao assumed office as President at the end of the General Assembly in Lyon, France in 1985, having served for two years as Vice-President (President-Elect) since his election at the General Assembly in Lyngby (Denmark) in 1983. Prof. Rao has been associated with IUPAC since 1971. He was a member of the Committee on Teaching of Chemistry from 1971 to 1981 (Chairman 1974–81), has served on the Commission on Molecular Structure and Spectroscopy from 1971 to 1983 (Chairman 1981–83), and has been an elected member of the Bureau since 1977. He was IUPAC representative on the ICSU Committee on Teaching of Science (1977–79).

Vice-President:
Prof. V. A. Koptug, USSR (1985–87)

Prof. V. A. Koptug was born in 1931, in Yuchnov, Kaluga District, USSR. He graduated from the Mendeleev Institute of Chemical Technology, Moscow, in 1954 and was appointed Junior Research Fellow in 1957. In 1959 he was appointed Senior Research Fellow at the Institute of Organic Chemistry, Novosibirsk, later becoming Head of Laboratory and Head of Department. He was awarded his Doctorate of Chemistry in 1963 and became Professor (of physical organic chemistry) in 1965.



Prof.
V. A. Koptug ▶

He is Vice-President of the Academy of Sciences of USSR and President of the Siberian Branch of the Academy of Sciences of the USSR. He became an Academician in 1979. He was Rector of Novosibirsk State University from 1978 to 1980.

Prof. Koptug's research interests include mechanisms of organic reactions, carbonium ion chemistry, spectroscopy, and computer applications in chemistry and chemical education.

He is the author of some 300 articles, 30 patents and 3 monographs and is also a member of the editorial boards of 3 scientific journals.

He became a Titular Member of Commission I.5 in 1957, was elected to the Bureau in 1979 and was re-elected in 1983. He has also been Chairman of the Advisory Committee on Chemical Data Bases.

Secretary General:
Prof. T. S. West, UK (1983–87)

Prof. T. S. West, born in November 1927 in Peterhead, Scotland, UK, received his BSc at Aberdeen University and his PhD and DSc (1962) at the University of Birmingham. In 1963 he moved to Imperial College, London, as Reader in Analytical Chemistry, becoming Professor in 1965. Ten years later he was appointed Director of the Macaulay Institute for Soil Research, Aberdeen, the position he now holds.

Prof. West has been active in the Society for Analytical Chemistry (President 1969–71). He serves on the Council of the Royal Society of Chemistry and is a member of its International

Affairs Committee. Prof. West has also been active on committees of the Royal Society which is the British National Adhering Organization of IUPAC. He currently serves on the British National Committee for Chemistry and was Chairman of its Analytical Subcommittee for 18 years. He has also been a member of the joint Royal Society/Royal Society of Chemistry Nomenclature Subcommittee.

His research interests cover a wide area in the field of analytical chemistry, including atomic and molecular absorption and fluorescence spectroscopy, polarography, trace analysis in general, chelate chemistry and biosignificant trace elements in soils and plants. He has lectured on analytical chemistry throughout the world and has received a number of national and international awards and distinctions.

Prof. West's IUPAC experience started in 1965 when he became Secretary of Commission V.3. He was elected to the Division V Committee in 1971, Vice-President in 1973 and served as Division President 1977 to 1981. He was appointed Assistant Secretary General in 1981 and has been very much concerned with the development of the Affiliate Membership Scheme.

Treasurer:

Prof. A. Björkman, Denmark (1984–87)

Prof. A. Björkman was born in Stockholm, Sweden, in May 1920. He was awarded his PhD at Stockholm in 1948 and DSc by the University of Gothenburg in 1957. He worked on industrial fermentation at KABI (Sweden) and then, in 1945, as Assistant Professor at the Royal Institute of Technology. In 1948 he joined Billeruds AB to do research and develop-



Prof. A. Björkman

ment in the pulp and paper industry and in 1961 was appointed Professor of Chemical Engineering and Technology at DTH, Lyngby, becoming a Danish citizen in 1962.

Prof. Björkman is a Fellow of the Danish Academy of Technical Sciences, the Danish Society of Natural Sciences, the Institute of Energy (London), and Foreign Fellow of the Swedish Academy of Engineering Sciences. He is also a Fellow of the International Academy of Wood Science. The Academy elected him to various positions including Secretary/Treasurer, 1980–84.

From 1968 to 1974 Prof. Björkman was Danish National Representative on the IUPAC Macromolecular Division Committee and was elected to the Finance Committee in 1971, serving as Chairman from 1977–81. He assumed office as Treasurer in 1984.

A typical day in the life of Prof. C. N. R. Rao

"I am proud to be a chemist"

How would you describe a typical working day in your life? Here, in the first of a series of articles, Prof. C. N. R. Rao, President of IUPAC, records what he does in a typical day.

I get up normally between 5.30 and 5.45 a.m. and immediately go for a long walk lasting about an hour. When I come back home, I immediately get ready, have breakfast and go to work around 8.00 a.m.

The first thing I do in the morning is to concentrate on my research work. I can do this without any disturbance up to 9.30 a.m. since most students and staff members come to the departments after this time. I do quite a bit of reading and writing

related to research at this time. Around 9.30 a.m., I start discussing research with some of my PhD students or post-doctoral fellows. I do this till about 11.00 a.m., spending a few minutes in between for dictation to my secretary in the department.

Around 11.00 a.m., I move to the office of the Director. Being Director of the Indian Institute of Science, I have to worry about various aspects of planning, administration, budget and campus development. We have over 30 departments in the Institute. This being an Institute for post-graduate research and education, I am assisted by a reasonably large Secretariat, a Chief of Administration, a Registrar, several Deputy and Assistant Registrars, and a Financial Controller. I tend to spend much of my time as Director on planning, faculty recruitment and promotion, and other academic matters. I am slowly leaving the routine administrative matters to be managed by other officers who assist me in this regard.

The Institute is recognized as the best research Institute in India. My aspiration is to make it the most important centre for research in science and engineering not only in India but in the world at large. Today, the Institute probably has a larger number of scientists of repute than any other institution in the country.



Main building, Indian Institute of Science, Bangalore.

The Institute has about 1300 research and post-graduate students, 400 faculty and about 1500 technical and other support staff. It is located on a campus of about 500 acres. It is equipped with sophisticated equipment, including a computer, and also has a beautiful campus. The Institute is now 75 years old and, as Director, I sit in a building constructed about 75 years ago by the first Director of the Institute, Sir Morris Travers.

I work in the Director's office up to 1.00 p.m. and return to my office in the laboratory to read behind closed doors between 1.00 p.m. and 2.00 p.m. This is generally the lunch time for the Institute. I have

some buttermilk, fruit (or boiled vegetables) and black coffee for lunch. I stay in my laboratory office up to 3.00 or 3.30 p.m. working with my co-workers in research and then come back to the office of the Director and work there till about 5.30 p.m. I often return to the laboratory to work there for another hour or so.

During the day, I discuss several matters with colleagues and various committees. Around 10 persons get appointments every day to see me. I chair four meetings of the Senate per year and attend four meetings of the Council of the Institute in the year. These are the most important meetings of the Institute.

During the day, much of the correspondence I do is as the Director of the Institute. I have a very efficient office and my Secretary as well as others help me in handling all this. Most of my professional correspondence, manuscript preparation and other paper work is handled in the departmental office.

I spend about half an hour a day dealing with correspondence as President of the Indian National Science Academy and another half an hour on matters related to the International Union for Pure and Applied Chemistry. The latter may increase soon. These are also handled either by my office in the laboratory or in the office of the Director. I handle many matters through telex messages, telegrams or phone calls.

The most important thing in my life is doing research with my co-workers, particularly PhD students. I work for 5 to 6 hours per day during office hours and some more later at night, up to 8 hours per day all told towards my research. On Saturdays and Sundays, I fully devote my time to the research work. I do much of the writing on these two days although I do some writing during the week days as well. I write about 20 research papers and reviews per year. These are generally published in the very best journals. I also write books. I have just written my 13th book. This is being published by Cambridge University Press.

I give lectures all over the country and attend a few international conferences every year. I am often called to inaugurate conferences or deliver main lectures, named lectures, convocation addresses and so on, although I limit these types of engagements. I also do not accept memberships of committees unless these are very important. The most important committee I attend is the Science Advisory Committee to the Union Cabinet. I also attend the meetings of the Society of CSIR. I attend all the meetings of the Council and other committees of the Academy as President of the Indian National Science Academy.

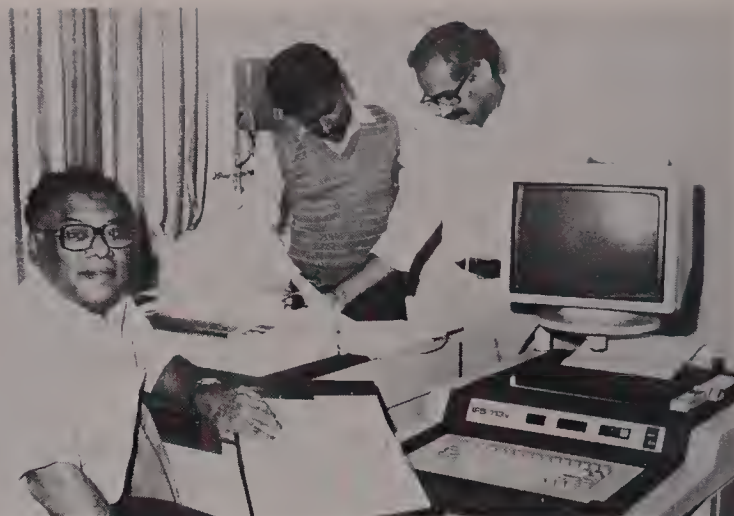
I have to go out of Bangalore at least twice a month. This cannot be avoided.

Whenever I have time, I read chemistry journals,

many of which I get directly. If I get extra time, I spend it on reading fiction, history or philosophy. The best relaxation I have is reading and walking in the gardens. Whenever I had time, I used to do gardening at home. Now that I live in the residence of the Director of the Institute which already has a big garden, I spend much of my spare time in improving the garden, nursery and afforestation of the Institute. We are now developing the new Jubilee gardens on the campus.

Only my wife and I reside at Bangalore. Both of our children are no longer with us, my daughter being married to a scientist with a PhD from Cambridge. My son is studying elsewhere for his Master's degree. My wife is a Reader in education in a local college. We have a very quiet life and try to avoid social life as much as we can. We enjoy listening to music after dinner; doing some scientific work with some background music is really enjoyable.

I am proud to be a chemist. Chemistry has given me the greatest pleasure in life. I feel that chemistry is such a broad-based discipline that we can work on almost anything and still call it chemistry. This is because chemistry has interfaces with most branches of science. I am a chemical physicist interested in spectroscopy, molecular structure, solid state chemistry and surface science. I have also worked on problems related to biology. I have enjoyed whatever I have done. Although I want to do a great deal more, I would like to believe that some of the work I have done till now is of value to the profession. I cannot think of anything more exciting other than doing research. I still enjoy writing papers and correcting proofs. I shall quit



Prof. Rao in one of the Institute's laboratories.

science when I stop enjoying doing these things. I think that it is this attachment to science that keeps me going. It is extremely important to have something to live for. In my case, this has been mainly scientific research and the contributions I can make to the scientific community.

Living in a developing country, conditions for research are not ideal. One has often to face frequent electricity shut-downs and shortage of water supply. All my laboratories have their own electric generators and close-circuit water supply. We maintain all the sophisticated equipment, most of which involves ultra high vacuum or sophisticated electronics. We build many of our instruments. We have done all this with a lot of difficulty, often losing sleep. But such an effort has been worthwhile and satisfying, since many young bright scientists have come out of these laboratories.

Secretary General's column

The purpose of this column is to keep readers aware of the discussions of the Council, the Bureau and the Executive Committee of the Union. Every two years all IUPAC bodies meet together in one place at the General Assemblies of the Union. The Divisions and Commissions which are the scientific bodies of IUPAC meet first, then the Bureau, which consists of the Division Presidents and not less than 10 members elected by the Council and, finally, the Council itself which is composed of the delegates of the National Adhering Organizations (NAOs) of IUPAC. These latter are normally the Academies of Science or, in some cases, the Chemical Societies of the 42 IUPAC countries: they constitute the Members of the Union.

In August/September 1985 the 33rd IUPAC General Assembly was held in France at École Supérieure de Commerce in Écully, a suburb of Lyon. Some 1000 Division members, national representatives, observers and Council delegates were present. This corresponded to about 72 per cent of all chemists engaged in the work

of IUPAC bodies and made for a busy and effective meeting. Our French hosts made excellent arrangements and the schedule of meetings operated very smoothly indeed.

The scientific work of the Divisions and Commissions is discussed in the Reports of the Division

Presidents and the Commission News section. Some of this has already been published in *Chemistry International* (CI, No. 6, pp. 13–30, 1985), more appears in this issue, and the remainder will be published subsequently. I will, therefore, concentrate on various policy matters discussed by the Council and Bureau.

New President and Vice-President of IUPAC 1985–87

The President of the Union serves for two years as Vice-President/President Elect, a further two years as President and, finally, two years as Past-President on the Bureau and Executive Committee. The Past-President is not an Officer of the Union. At Lyon, Dr W. G. Schneider (Canada) finished his term as President and has now been succeeded by Prof. C. N. R. Rao (India). In an unopposed election, Prof. V. A. Koptug (USSR), Vice-President of the Academy of Sciences of USSR and President of the Siberian branch, was elected Vice-President of IUPAC with acclamation. There was no election for Treasurer nor Secretary General since these Officers, respectively Prof. A. Björkman (Denmark) and Prof. T. S. West (UK), were elected for a four-year period in 1983. A brief account of the Officers is given on pp. 4–6.

Elected Members of the Bureau

The retiring members of the Bureau at Lyon were Dr J. W. Barrett (UK), Prof. A. D. Campbell (New Zealand), Prof. A. Kjaer (Denmark), Prof. J. Michalski (Poland) and Prof. C. G. Overberger (USA). Of these, only Prof. Campbell was eligible for re-election to a second period of four years. Those members of the Bureau continuing until 1987 are Prof. A. J. Arvia (Argentina), Prof. Y. Jeannin (France), Prof. D. B. Tonks (Canada), Prof. A. A. Vlček (Czechoslovakia) and Prof. H. Gg. Wagner (FRG). The election of Prof. Koptug as Vice-President of the Union created a further vacancy amongst the elected members. The Council decided to fill six vacancies, bringing the total number of elected members to eleven, that is, one more than the statutory minimum number of 10.

The candidates nominated for election by the NAOs were as follows: Prof. R. D. Brown (Australia), Prof.



“Our French hosts made excellent arrangements”

A. D. Campbell* (New Zealand), Prof. V. Gold* (UK), Dr Mary L. Good* (USA), Prof. Wei-Yuan Huang* (China), Prof. S. Itô* (Japan), Prof. W. D. Von Phillipsborn (Switzerland), Prof. I. Wadsö* (Sweden) and Prof. W. Zielenkiewicz (Poland). The Bureau is required, where there are more candidates than vacancies, to make recommendations to the Council for filling the vacancies. Bearing in mind factors such as present and recent geographic regional representation, the disciplines of the candidates and their experience of IUPAC, the Bureau recommended election of the candidates whose names are asterisked in the above list. All candidates so designated were elected.

At the end of the General Assembly the “new” Bureau met briefly to transact essential business. It elected two of its members to replace Profs Michalski and Overberger on the Executive Committee. Those chosen were Dr L. Good and Prof. Vlček. The Executive Committee, therefore, now consists of the Officers, the Past-President, Dr Good, Prof. Jeannin and Prof. Vlček.



Prof. Victor Gold in Lyon.

Tragically, I have to report the sudden death of Prof. Victor Gold of King's College London, only three weeks after his election to the Bureau. Prof. Gold was one of IUPAC's most active and effective chemists. His loss will be felt keenly by the Union and even more particularly by those of us who were fortunate to be closely associated with him. The vacancy created by his death cannot be filled between General Assemblies.

A Pride of Presidents

I should like here to pay a warm tribute on behalf of the Union to retiring Past-President Saburo Nagakura of Japan, a wise, forward-looking and quite outstanding President of the Union. Jan Michalski (Poland) and Charles Overberger (USA), retiring members of the Executive Committee and both originating from the Macromolecular Division, deserve a special word of thanks for their unfailing hard work for the Union and for their visible enjoyment of it. Formidable in debate,

unfailing in foresight, and warm in their personal support of all things IUPAC, they are remarkable men. Jack Barrett (UK), another macromolecular chemist (!), and Anders Kjaer (Denmark) have also given long and uniquely distinguished service to IUPAC on the Bureau, the Division and other Committees. Their selfless devotion and enormous contribution to the Union is remembered by all. Lastly, I should like to say a special word of thanks, personal as well as official, to the Division Presidents who retired from office at Lyon. These are Mary Good (USA) of the Inorganic Division, who has now become an IUPAC "Bureaucrat" and "Executive", Giorgio Modena (Italy) of the Organic Division, C. H. (Bam) Bamford (UK) of the Macromolecular Division, Fernand Pellerin (France) of the Analytical Division, Helmut Frehse (FRG) of the Applied Division and Bill Sunderman, Jr (USA) of the Clinical Division. I venture to suggest that if there were to be a collective noun for a group of IUPAC Division Presidents it would, in this case unquestionably, be a pride of Presidents.

No longer a charmed circle

The Bureau, at its meeting in 1984, approved the decision of the Officers to set the new Affiliate Membership Scheme in motion with effect from January 1986. Affiliates of IUPAC will be aware that hitherto it was not possible for chemists voluntarily to become involved in IUPAC's affairs. It was only possible to become a member of a Commission or Working Group by invitation. Thus it could, with some justification, be said that IUPAC was an exclusive body. At its meeting in Lyon, the Council heard with interest of the arrangements made to allow the new Scheme to be launched in the 42 IUPAC member countries in 1986. The news that the Canadian Commission for UNESCO had sponsored the provision of US-\$10 000 from UNESCO funds and that ICSU (International Council of Scientific Unions) had donated US-\$5000 specifically for the enrolment of Affiliates in developing countries, was widely welcomed. The Union has now offered 500 such sponsored two-year Affiliate Memberships to the appropriate authorities in such countries at a nominal cost of US-\$1.0 (equivalent) each.

Chemists invited to join in the world-wide experiment

IUPAC has thus thrown its doors open to the world's chemists and invited them to come in and become involved in their International Union's affairs. The "Great Experiment" is being undertaken in many IUPAC countries in 1986 and others, which for technical reasons could not participate in 1986, will do so in 1987. Potentially, there are many hundreds of thousands of chemists the world over who could support IUPAC and thus provide chemists and chemistry with a unique information base unavailable in any other science discipline — except for astronomy. The International Astronomical Union (IAU), although being relatively much smaller, has some 5000 members world-wide. I should like to stress here that

IUPAC is offering this facility at estimated cost and is not seeking to secure an inflow of funds. Similarly, the chemical societies which, with the consent of their NAOs are operating the IUPAC Affiliate Membership Scheme *via* their membership organization, have agreed to add only minimal charges for overheads and postage for the discharge of the Scheme. IUPAC can only continue with the Scheme beyond 1987 if there is sufficient support for this imaginative venture from the chemists of the world. The value of this support to the Union will be enormous. All interested chemists will be fully briefed and will have the opportunity to contribute to and influence the decisions that are made on behalf of chemistry at the top level of international science.

In addition, IUPAC will be able to talk at an international level with an authority it has never before had. The Scheme will also be open to all countries of the world, not just to the 42 member nations. I urge all readers, whether or not they are members of Divisions or Commissions, to support this vital experiment by becoming Affiliates of IUPAC *via* their Chemical Societies as soon as the latter make the facility available. Furthermore, we need active participation from you, the reader, to recruit at least one other chemist: be an agent, please, for IUPAC and help with what I have dared, here, to call the Great Experiment. The Council, the Bureau and the Officers of the last six years have done their best to offer all chemists a place in their International Union: it is now for the chemists of the world to decide whether or not the venture will succeed. Several other International Scientific Unions are awaiting the outcome of the great IUPAC experiment with considerable interest. Even ICSU itself is debating whether or not it will follow our example to launch a similar scheme and a "Science International" Journal.

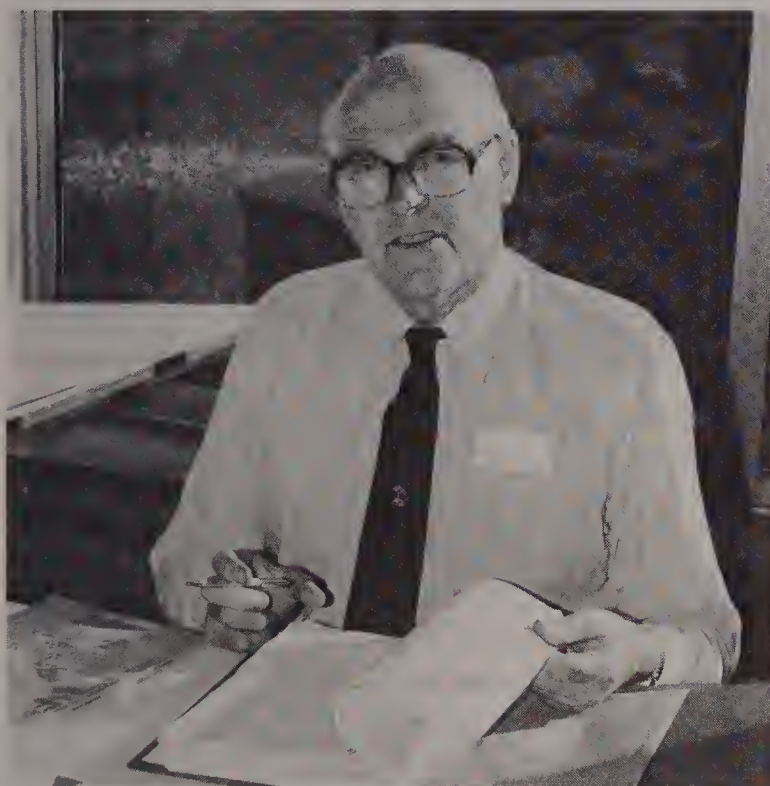
One final word is perhaps necessary to clear up a possible misunderstanding. The word "Union" in IUPAC's name means solely that it is an "association" of chemists, on an international basis, to look after the interests of the scientific discipline of chemistry at the interface with other disciplines, for example, physics, geology, and the life sciences. IUPAC operates on a totally non-political basis without regard to race or religion. Unlike a trade union it does not become involved with conditions of employment and related matters. IUPAC is a scientific body exclusively concerned with the science of chemistry and its relation to other sciences.

CHEMRAWN

Internationally, IUPAC has become quite well known in recent years for its organization of a series of highly successful meetings under the general title of *CHEMical Research Applied to World Needs* (CHEMRAWN). These conferences, planned carefully under the dynamic leadership of Dr Bryant Rossiter (USA) and the CHEMRAWN Committee, have underlined the social responsibility of chemistry to the needs of mankind. CHEMRAWN I, in Toronto 1978, on "Future Sources of Organic Raw Materials", held

against the background of the world energy crisis, discussed a vital topic and its published perspectives and recommendations have already influenced thinking at governmental levels in several countries.

CHEMRAWN II on "Chemistry and World Food Supplies", held in Manila 1982, was also quite unique and has produced an even more significant impact. The first of a series of follow-up CHEMRAWN II workshops planned by the CHEMRAWN II Future Actions Committee was held with government officials and research scientists in Sri Lanka in January 1985. The Council heard of the CHEMRAWN III Conference on "Resources Material Conversion" held in The Hague in June 1984 against a background of a much more assured supply of oil, well beyond 2000 AD, supplemented by other energy resources such as nuclear energy, coal and gas. The impact of biotechnology — genetic engineering, protoplast fusion and the culture of animal and plant cells — was a major discussion point and the need to develop a complete chemobiotechnological process-engineering industry. Revised plans for CHEMRAWN IV on "The Global Ocean, its Chemistry and Resources", to be held in Woods Hole, USA, were revealed. The Conference will focus on oceanic chemical processes, cycles and resources im-



Prof. T. S. West, Secretary General of IUPAC, in Lyon.

portant to mankind. CHEMRAWN V on "Current and Future Contributions of Chemistry to Health" is to be held in Heidelberg in September 1986, while CHEMRAWN VI on "Advanced Materials for Innovations in Energy, Transportation and Communications" will take place in Tokyo in May 1987. Some unease was expressed during the Council discussion by the rather high frequency of occurrence of the CHEMRAWN conferences, but there is little doubt that it is spearheading an excellent state of the art activity for chemistry and underlining its many benefits for mankind. It should be stressed that CHEMRAWN is much more than just a series of conferences. It is seminal; it is

ongoing beyond the conference itself; it is a vital activity of international chemistry.

New investment in work of Commissions

During the past few years the number of Titular Members on Commissions and Division Committees has been reduced from 8 to 6 and 10 to 8 respectively. The improved financial situation of the Union led the Officers and Bureau to recommend to the Council that some relaxation was permissible to allow those Commissions that could show sufficient cause, to recruit one more Titular Member. The Council approved this measure but, on the other hand, refused to approve an increase of national subscriptions partly to offset the increased costs. Council delegates pointed to the improved current assets and said that these should be used for the purpose rather than transferred to the reserves as recommended by the Treasurer and Finance Committee. The warning of the Treasurer that the improvement was largely due to the improved standing of the US-dollar in which IUPAC collects its national subscriptions and the lower value of the pound sterling in which currency the Secretariat costs are met, was not heeded. The National Subscriptions were, therefore, maintained at their 1985 level for the next biennium. Whilst it is the prerogative of the Council to make such decisions, it does appear to the Officers that a modest increase for 1986–87 would have been preferable to a much sharper increase in 1988–89, which may well become necessary at the 1987 General Assembly in Boston and may cause serious problems for the NAOs.

Greater participation in IUPAC

At the 31st General Assembly in Leuven (1981), the delegates of the Federal Republic of Germany proposed a change to the Statutes and Bylaws to limit the total time in service for an individual in the Commissions of any one Division or of more than one Division. This was not aimed at preventing upwards movement from Commission membership through the Division Committee and on to Bureau, but rather to limit sideways motion amongst Commissions and specifically to permit a greater turnover and thus the active involvement of a larger number of chemists in IUPAC's affairs. Suggestions for such changes were discussed at the 1983 General Assembly in Lyngby, but could not be instituted at that Assembly since changes in Statutes and Bylaws require that a minimum of ten months' notice be given to all the NAOs before an Assembly. This was, therefore, done in 1984 and the changes became effective immediately after the end of the 1985 Assembly. Now, special permission from the Bureau, which is not lightly given, is necessary for:

1. reappointment of a Titular Member who has served eight years;
2. the rotation of a person through alternate periods of Titular and Associate Membership beyond a total of twelve years;
3. membership in any capacity of more than one

Commission of a Division or of different Divisions beyond a total of twelve years.

In each case, the length of service applies whether periods of service are consecutive or not and in each case any extension will be for a period of two years, that is, until the subsequent General Assembly.

This news may not be particularly welcome to Commission members who have served long and faithfully on IUPAC Commissions, but most of them will appreciate the need to let others share the experience of serving on an IUPAC body. It is good news for Affiliates seeking Associate Membership of Commissions, followed by Titular Membership then perhaps service on Division Committees, the Bureau and even election as an Officer of IUPAC. To Affiliates, I should also say that it is probably significant that most IUPAC people, despite the long hours of hard work involved, are very sorry indeed to have to leave the Union when they have reached the maximum permissible period of service.

IUPAC togetherness

Restrictions of space do not allow me to discuss many other matters of business at the Lyon Assembly but, if the Editor permits, I will perhaps return to some of them in a subsequent issue of *CI*. Meanwhile, however, I would like to close by mentioning a few ideas that were "flown" at the Lyon Assembly.

1. There might be a *IUPAC Lecture* given to the assembled Delegates of Commissions and Division Committees, Members of the Bureau and as many Council delegates as can attend. Part of the rationale of this idea is to provide a focus for *all* IUPAC people. At present there are usually "open" Division meetings where all of the Commission members of a particular Division meet together to discuss that Division's affairs. But rarely, except at the crowded lunch or evening meal sessions, is there a place for all of us to get together unless it be briefly at a civic reception. Perhaps the "lecture" and the reception could go together to give us this get-togetherness which we sometimes almost attain. Perhaps a short Presidential address on the "State of the Union" which is given biennially to the Council, but never as yet to the working chemists of the Commissions, might be another useful focus for IUPAC General Assemblies. Perhaps a following open debate to allow the Officers and Division Presidents to be cross-examined might be another useful focus for the General Assemblies. Dare I suggest that Commission and Division Committee members pick up their pens and write a few words for the Editor's Correspondence Column on this or some similar topic? Chemists are said by some other scientists to be losing their disciplinary identity — perhaps we should do something about this at the Assembly either in the small way suggested above or in some other way which you may bring to our attention.

2. Another idea was that IUPAC should look somehow at the social responsibility of chemistry —

and chemists. At present the Union deliberately does not enter into such debates and tends to leave such issues to ICSU. But the CHEMRAWN Conferences are already a step up in this direction. The concerns of our Committee on Teaching of Chemistry (CTC) with its emphasis on teaching aids and methods for developing countries is another such step, as indeed is the extension of IUPAC into developing countries *via* the new Affiliate Membership Scheme. Observations and suggestions on this theme would be most welcome.

3. Yet another problem for chemists, the world over, is the popular (I should perhaps say *unpopular*) image of chemistry and chemists. To the layman the innumerable benefits brought to mankind and the quality of life by chemistry and chemists are completely obscured by the vision of chemical hazards, explosions, fires, pollution of every kind. Should IUPAC not bend its mind to improving the image of the central science?

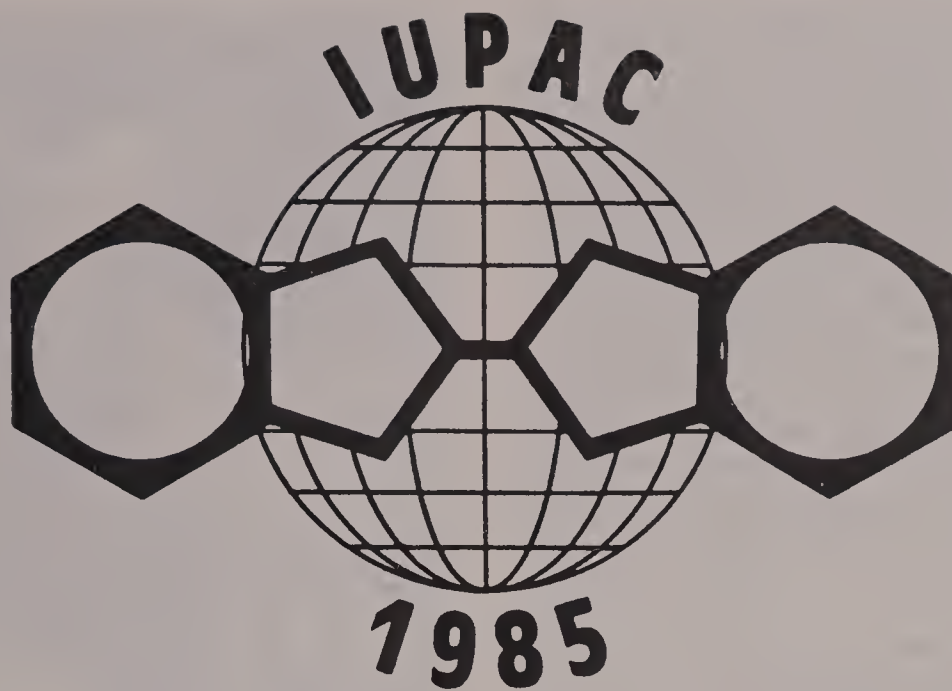


École Supérieure de Commerce, venue of the Lyon General Assembly, 1985.

125 years ago

The Lyon General Assembly coincided exactly with the 125th anniversary of the first international scientific conference ever held. The meeting was held in Karlsruhe, Germany 3–5 September 1860 and attended by 127 chemists from Austria, Belgium, France, Germany, Great Britain, Italy, Mexico, Poland, Russia, Spain, Sweden and Switzerland.

At the top of the agenda of points to be discussed at the Karlsruhe Congress of Chemists was the question, "Shall a difference be made between the expressions *molecule* and *atom*, such that a molecule be named the smallest particle of bodies which can enter into chemical reactions and which may be compared to each other in regard to physical properties — atoms being the smallest particles of those bodies which are contained in molecules?" No consensus was reached!



The Manchester Congress

The Scientific Programme

A further brief selection of the summaries and abstracts of the oral and poster presentations at the Manchester Congress. Others were published in the previous issue of *CI* (No. 6, pp. 37–40, 1985).

Some Recent Work in Atomic Fluorescence

Prof. S. Greenfield (Loughborough University of Technology, UK)

ASIA is an acronym for atomizer, source, inductively coupled plasmas, in atomic fluorescence spectrometry. In this new technique for the elemental analysis of materials, a low-powered electrical discharge, or plasma, is used to dissociate molecules into atoms. This plasma is known as an atomizer. A high-powered plasma, known as the source, emits radiation which is absorbed and raises the atoms in the atomizer to a higher energy level. When these excited atoms decay to their original state the energy they release is given out in the form of light. This light, when analysed by a spectrometer, gives information as to the elements present and their amount. This technique of ASIA offers similar sensitivities to other established optical methods but with much greater freedom from mutual interference caused by the light emitted by the other elements present in the material under investigation.



Recent Advances in IR and Laser Dyes

Prof. K. H. Dreshage (University of Siegen, Siegen, FRG)

Whereas most substances show no or only weak absorption of visible light, some organic compounds ("organic" meaning: made up from carbon, hydrogen and perhaps a few additional elements like, for example, nitrogen, oxygen) do absorb part of the visible spectrum very strongly: the *dyes*.

Beyond the red part of the visible spectrum the radiation — invisible to our eyes — is called the infrared (IR). In this region only very few compounds are known to absorb radiation very strongly, that is, behave like dyes. Earlier theoretical work called in question the very existence of dyes absorbing at wavelengths beyond 1.3 μm . However, we were able to prepare dyes that absorb up to about 1.6 μm .

Following the absorption of light many dyes also emit light, the so-called fluorescence. With infrared dyes the fluorescence occurs in the infrared. Related to the fluorescence (spontaneous emission) is stimulated emission, the basis of lasers. Our new dyes have been utilized to make tunable dye lasers that emit in the infra-red up to 1.8 μm . Previous dye lasers stopped working at about 1.2 μm .

Bioorganic Chemistry of Rhodopsins

Prof. Yu. A. Ovchinnikov (USSR Academy of Science, Moscow, USSR)

Bacteriorhodopsin and rhodopsin are light-sensitive membrane proteins. Bacteriorhodopsin functions as a proton translocase. Rhodopsin is a regulator of the mediator level in the visual cell. Both proteins belong to a class of highly hydrophobic integral membrane proteins. The C-terminal regions of these proteins are exposed into cytoplasm. Bacteriorhodopsin and rhodopsin are made up of 248 and 348 amino acids, respectively. Their amino acid sequences are known both from the analysis of the protein and the corresponding structural genes. From the data on amino acid sequences as well as on secondary and tertiary structures, the models for arrangement of these proteins in the membrane were proposed. These proteins can be completely denatured by various methods and regenerated by addition of phospholipids and the corresponding retinal. Retinal residues were shown to be attached through protonated aldimine bonds to lysine 216 and 296, respectively. Structural genes for bacteriorhodopsin and rhodopsin were cloned. The gene coding for rhodopsin contains four introns. Expression of the gene for bacteriorhodopsin into *E. coli* was carried out. These studies laid the basis for site-directed mutagenesis aimed at structure-functional investigations of bacteriorhodopsin.

Surface Phases, Phase Transitions and Surface Chemistry

Dr P. R. Norton (Chalk River Nuclear Laboratories, USA)

Heterogeneous catalysis covers the class of surface processes which permit chemical transformations to



Prof. Ovchinnikov prepares notes before his lecture at the Manchester Congress.

occur rapidly at temperatures and pressures where reactions would normally be very slow in the absence of a catalyst.

The art of catalysis, developed since the time of Michael Faraday in the mid-19th century, has always outstripped the understanding. Modern scientific methods have yielded an improved but still incomplete understanding of the microscopic processes involved, but it is clear that catalysts operate by reducing the barriers to reaction: that is, they influence the *rate* of the chemical process.

Control over the precise ordering of atoms at a surface has shown that different atomic arrangements yield different rates of reaction. One special class of ordering phenomena is that involving phase transitions. In a surface phase transition, surface atoms move from one set of preferred sites to another. These small movements (less than 10^{-10} m) can produce profound changes in surface reactivity which, for example, can cause reaction rates to oscillate or surface compounds to decompose in an almost explosive fashion.

At the Chalk River Nuclear Laboratories of Atomic Energy of Canada Research Company Limited, Ontario, Canada we have applied a unique range of methods, including million volt ion beams to study these minute movements and the resulting changes in surface chemistry. Our goal is to apply modern methods of surface science *in situ* during catalytic reactions to elucidate the microscopic mechanisms of heterogeneous catalysis. This should ultimately lead to the design of better catalysts.

Aspects of Optimization of PVC Matrix Membrane Ion-Selective Electrodes

Dr J. D. R. Thomas (UWIST, Cardiff, UK)

Ion-selective electrodes (ISEs) are devices for measuring and exercising control of the levels of ions in various branches of industry, medical diagnosis and health care, environmental control, drug analysis, and even in the washing of clothes. The PVC matrix membrane types, first designed in their simplified form at University of Wales Institute of Science and Technology (UWIST) in the late 1960s, are now widely used and studied in more than 30 countries throughout the world's five continents.

The essential principle depends on the electro-active components, trapped in the PVC membrane, being able to recognize certain ions in preference to others. For example, a potassium ISE will recognize potassium ions in blood, but will disregard the sodium, calcium and chloride ions that are also present, and the voltage generated by the electrode will be related to the quantity of potassium in the blood. This ability to monitor potassium may be used in hospitals to keep an

eye on the condition of patients during surgery, particularly heart, liver and cancer operations. Likewise, a nitrate ISE may be used to monitor nitrate in waterways, especially where there has been an over-reliance on nitrate-type fertilizers. Calcium ISEs are important for the monitoring of calcium ions in blood and for monitoring control in the use of detergents for overcoming hardness in water used for the washing of clothes. Electrodes sensitive to appropriate drug-type materials may be used for measuring drug levels in medicines.

It is with an eye on these and other applications that Dr Thomas described the changes that sometimes have to be made to the electrode membrane components in the PVC matrix in order to overcome undesirable effects of the presence of certain deleterious components in samples. He showed how the detrimental effects of detergents in washing systems and of various biochemicals in blood fluids can be overcome. He also described the design of a sensor for monitoring lithium ions in blood fluids during therapeutic treatment of manic psychosis. Alternative designs for electrodes for use in unusual situations, such as microelectrodes for monitoring heart muscle fluids, were also considered.



◀ Dr J. F. Gibson



Dr B. L. Booth ▶

Posters

Radiolytic reduction of amino acid esters to amino alcohols

Prof. R. Badiello (Bologna, Italy)

The present research deals with a study of selective radiolytic reduction of amino acid esters to amino alcohols in order to propose a method for the determination of C-terminal sequence in proteins. The methods described in the literature on the reduction of C-terminal groups to amino alcohols use powerful reducing agents, i.e. lithium aluminium hydride with consequent possibility of chemical damage to the whole

macromolecule.

Experiments have been carried out on simple model compounds such as N-acetyl amino acid esters irradiated in aqueous solution choosing suitable conditions in order to have only reducing species and not the oxidizing species. The analyses of the radiolysis products have been performed by means of chromatography and electrophoresis.

Parallel studies of pulse radiolysis have been carried out in order to investigate the site of attack of the reducing species on the model compound.

The results were discussed and a comparison of this method with the conventional chemical reduction was made.



Prof. N. Adler

Relative proportions of Coil, α -Helix and β -Structure in Conformations of Polypeptides caused by Surfactants

Prof. K. Takeda (Okayama, Japan)

Although conformational changes of polypeptides have been studied in surfactant solutions, few quantitative analyses have been made on these conformations. In this work, the relative proportions of α -helix, β -structure, and random coil in each conformation of polypeptide caused by surfactants were computed by simulating a mixed spectrum of typical CD spectra for these structures to the experimentally obtained spectrum. The simulations were carried out in the wavelength regions of 190–250 and 200–250 nm at 1-nm intervals. When the polypeptide assumed α -helix to some degree, the computed spectrum excellently agreed with the experimental one.

Poly(L-ornithine) adopted an unstable and a stable helical structure below and above the sodium dodecyl sulphate (SDS) concentration range where β -structure was favoured, respectively. The relative proportions of the unstable and the stable helical structures were less than 50 and 73% respectively. Poly(L-lysine) adopted a stable helical structure of about 50% in sodium octyl sulphate solutions and 100% β -structure in SDS solutions. The helical structure necessarily coexists with some proportions of β -structure and random coil in the

conformations of these homopolypeptides. The simulation was also applied to protein conformations in surfactant solutions.

The Influence of Weathering on Oil Spill Identification

Profs. N. Adler and N. Koprivanac (Zagreb, Yugoslavia)

The influence of weathering on an oil spill determination by infrared spectroscopy was studied. Hydrocarbons released into the water environment are modified and removed from the surface by a number of processes such as evaporation, emulsification, biological degradation and sediment interaction. The influence of these processes on hydrocarbon composition is not uniform and depends on a number of characteristics of the oil.

In this paper the changes in hydrocarbon composition of a crude oil, light and heavy gas oil, resulting from weathering processes were considered. Samples were taken during 15 summer days (W) of the exposure. The characterization of oil slicks on surface waters using IR studied by Kawahara, showed that the IR as a fingerprint method cannot be applied. However, the *ratio* of certain infrared absorbances (RIA) can be usefully applied to classifying petroleum pollutants in water. For this purpose the ratio between hydrocarbons in naphthenic, paraffinic, aromatic and methyl structures were studied. A regular slow decrease of RIA during the weathering occurs, which can be expressed by a linear equation with negative coefficient, i.e. $RIA = -aW + b$. The smallest changes in RIA for all samples (coefficient a ranging from -0.7×10^{-2} to -4.5×10^{-2}) were found for the two key ratios, i.e. the $810\text{ cm}^{-1}/720\text{ cm}^{-1}$ and the $810\text{ cm}^{-1}/1375\text{ cm}^{-1}$, which correspond to the hydrocarbons in naphthenic to paraffinic and naphthenic to methyl structure.

Biosensors for the food industry

Dr E. Kress-Rogers and Dr E. D'Costa (UK)

Instruments based on direct amperometric enzyme electrodes are being developed for process and quality control in the food industry. Marker chemicals for the assessment of deterioration processes such as microbial spoilage or oxidative rancidity are being studied to design biosensor-based instruments for shelf-prediction. For fresh chilled meat, the glucose depletion at the meat surface due to preferential consumption by the bacterial flora may serve as an indicator of the microbial surface load. The Cranfield electrode is being adapted to measure glucose profiles at chill temperatures in a meat environment. For some common edible fats, head-space analysis with gas chromatography-mass spectrometry indicates that aldehydes could be a suitable indicator compound for oxidative degradation.

Chemistry's Cornucopia

Sir George Porter

Can chemistry and the other sciences provide all man's essential needs? What can we do about the general public's "over-reaction" against chemicals? These are two of the questions discussed by Sir George Porter in this paper. The paper was presented by Sir George Porter on Monday 9 September 1985 as the Plenary Lecture at the official opening of the 30th IUPAC Congress in Manchester, UK.

Manchester's great chemists

It is appropriate that this meeting of the International Union of Pure and Applied Chemistry should be taking place here in Manchester. The area has long been a centre of industrial chemistry whilst the city and its University have been the home of some of our greatest chemists. There is a saying here "What Manchester thinks today, London thinks tomorrow" and, as far as physics and chemistry are concerned, one might add also Oxford and Cambridge. Among the organic chemists, our Chairman, Lord Todd, went directly from here to the Cambridge chair, whilst his predecessor, Sir Robert Robinson and his successor, Sir Ewart Jones were called to the other place.

The great chemists, Ernest Rutherford and Lawrence Bragg went from here, in succession, to the Cavendish chair of physics in Cambridge. You may

question my classifying them as chemists, but Lawrence Bragg spent most of his life determining the structure of chemical and biochemical substances and was my predecessor as Fullerian professor of *Chemistry* at the Royal Institution whilst Rutherford said that chemistry was a branch of physics and was rightly rewarded with the Nobel prize for chemistry!

Among the other distinguished chemistry professors here, I would like to be allowed to mention just one, who had the doubtful pleasure of converting me into a physical chemist. This was M. G. Evans, whose lectures to us undergraduates were the most inspiring that I have ever heard. His untimely death, soon after he came to Manchester, was a tragic loss to physical chemistry.

Two of the principal themes of chemistry, perhaps the two are the structure of matter and the energetics accompanying change from one structure to another

The author

Sir George Porter is Fullerian Professor of Chemistry of the Royal Institution and was Director there from 1966 to 1985. He was born in 1920 and educated at Thorne Grammar School, Leeds University and Emmanuel College, Cambridge. On completion of his doctorate degree he spent a further five years in the Physical Chemistry Department of the University of Cambridge. He was appointed Professor of Physical Chemistry in the University of Sheffield in 1955. In 1960 he was elected a Fellow of the Royal Society and shared the Nobel Prize for Chemistry in 1967. On 30 November 1985, he became President of the Royal Society. This is IUPAC's National Adhering Organization in the UK. Sir George's research interests are in the field of fast reactions, photochemistry, photobiology and solar energy. He is also interested in scientific education and the presentation of science to non-specialists.



and the founders of these two great sciences were both Manchester men. John Dalton gave us the first clear exposition of the atomic theory which included, unequivocally, the idea of atomic association into molecules having not only a definite atomic proportion but also a shape. It was nearly half a century before chemists acquired the confidence necessary to exploit this idea by making structural models as Dalton had done.

James Prescott Joule, the son of a Manchester brewer and Dalton's pupil, must receive much of the credit for the first law of thermodynamics, an extremely difficult concept at the time because it seemed to be at variance with the second law already put forward by Carnot. Together these two laws occupy a place in the molecular sciences comparable to that of Newton's laws in mechanics.

These great men would have thought it quite unnecessary to speak, on an occasion like this, about why they were doing research or the debt that mankind owes to chemistry. But so ill-informed is the average layman about chemistry, hearing from the media, as he does, almost exclusively about chemical accidents and disasters, that it becomes necessary for chemists, from time to time, to state the obvious.

Chemistry, health and wealth

Throughout history, the lot of most of mankind has been rather miserable. Until a few centuries ago it was real slavery and into the last century, although legally free, most men and women had to labour so hard to earn a living that they were effectively slaves to their work. Different professions have had different approaches to this problem. As Max Perutz has put it "The Priest persuades the humble people to endure their hard lot, the politician urges them to rebel against it and the scientist thinks of a method that does away with the hard lot altogether".

"Chemistry has provided a Cornucopia of good things, both of necessities and luxuries, which have improved our health, and our wealth and also I believe our happiness."

No branch of science has done more, or promises more in this respect, than chemistry. It has provided a cornucopia of good things, both of necessities and luxuries, which have improved our health, and our wealth and also I believe our happiness. Man is himself a biochemical system living in a chemical world. His *health* has been improved out of all recognition by better nutrition, better hygiene and by the drugs which have doubled his lifespan, relieved pain and made it possible for many handicapped people to lead a more normal life.

His *wealth*, judged in terms of the general availability of the necessities of life is many times what it was even

a few decades ago. This is particularly true of the wealth of food now available in countries which, only a few years ago, were poor to the point of starvation.

Most people today would also class as necessities the plastics, fibres and paints which have made it possible for everybody to be well clothed (though not all may want it!) and to live in a bright, clean environment without having to employ the labour of others to keep it so.

The luxuries, which are also fast becoming universal, often owe as much to chemistry as to the other technologies. This is obvious of such things as motor fuels, cosmetics and dyestuffs but it is also true of electronic devices of every kind, and mechanical, labour-saving appliances. Some of the largest manufacturers of heavy electrical equipment employ more chemists than physicists and, on the newer and lighter side, the silicon *chip* is a highly purified chemical element treated with other elements in a very sophisticated, chemically pure environment.

But perhaps the most successful of all, over the last two or three decades, has been the contribution of chemistry to agriculture. The "green revolution" did exactly what the King of Brobdingnag of Gulliver's travels had asked for and "made two ears of corn or two blades of grass grow where only one grew before" and those who brought it about, according to the King, "would deserve better of mankind and do a more essential service for the country than a whole race of politicians put together". This was a proud achievement of chemistry, depending heavily on fertilizers and new insecticides, plant growth substances and the like. It is a huge industry: in the United States crop production amounts to US-\$74 billion a year and the cost of the pesticides which make this possible US-\$4.2 billion. The world production of plant foods in the form of fertilizers has increased threefold over the last twenty years, and eighty times since the beginning of the century.

Since the war, the improvement of food productivity has been quite dramatic. In Britain, the same area of land yields twice as much wheat or potatoes, and the cow gives twice as much milk using less land. Fewer farm workers on less land supply a larger and better fed population with less imports and £1500 million worth of exports of farm products.

The cornucopia is overflowing, and the world, as a whole, is now awash with surplus food. Since 1964, *world-wide* production of wheat and food grains has doubled and kept ahead of population growth. 60% of this can be attributed to improved agricultural technology and the other 40% springs from price guarantees for producers and improved marketing conditions. Remaining areas of endemic food insufficiency include elements of the Middle East and South Saharan Africa. In 1985 China, for example, is now expected to produce the largest wheat crop in the world. Wheat production in the EEC has doubled in seven years. It is the same story round the world in those countries which used to

be held up as unable to feed themselves. India is effectively self-sufficient, Pakistan nearly.

Over-reaction against "chemicals"

How did mankind welcome these achievements? Did everybody thank the chemist and congratulate him on what had been done for the benefit of mankind? Well, not really! A decade or two ago, a period of depression began about science and technology. The "post industrial revolution" was discovered. Rachel Carson and many others questioned not only some genuinely worrying aspects of chemical pollution but often the whole ethic of modern technology. All science became suspect and none more than chemistry.

Quite quickly the generally accepted idea of "Better living through Chemistry" was transformed into an association of chemistry, in the public mind, with pollution, world shortages and iniquities of the multinational corporations. Many of the essentials to the green revolution, such as the pesticides, became primarily, in the layman's mind, destroyers of life. Since then we have had several chemical disasters; the 41 drums of dioxin-contaminated waste from Seveso in Italy (which caused no injury to anybody during transportation but concentrated many minds on chemical waste disposal) and the terrible leak of methyl isocyanate in Bhopal, India which killed 2500 people and injured over 100 000. The fact that the plant was making a "safer" pesticide, Sevin (which, unlike DDT, does not accumulate in the body), does little to compensate for the tragedy. Add to these the dreadful thalidomide story, the atmospheric pollution by chlorofluorocarbons, the dangers of hazardous chemical waste disposal, and "chemistry" is no longer, to many people, the beautiful word that it was.

But high crop yields depend on pesticides and weed killers, as much as upon fertilizers, because food plants

have to compete with weeds and pests, viruses and fungi. Without them, as Max Perutz has pointed out, the production of grain would fall by nearly a half in three years and we would have a famine of catastrophic proportions, like the Irish potato famine, which was caused by fungal infection. That is the prospect for so-called "organic farming". DDT is no more toxic to man than is aspirin and less so than the organic phosphates and carbonates which superseded it. It eliminated plague and typhus and, less completely, malaria, from most parts of the world. Not quite completely however; I was recently in Manila where I heard that, only fifty miles North, one half of the population still suffered from malaria of a particularly lethal kind.

Man-made insecticides can create important problems by accumulating in the food chain, and those known to be dangerous in this way have been largely replaced. New pesticides are being synthesized all the time; they have to be because pests become clever and develop a resistance to them. It is a big and expensive business; thousands of compounds have to be synthesized and tested on animals, and in the fields, for every one that is commercially used. But only in this way has it become possible to feed an ever-growing world population.

The memory of how the people of the world suffered without science is soon lost, and younger people never knew that world. They see only the remaining problems and human errors, some of which we can solve and prevent but some of which we shall always have to live with. It is ethically no more justified to take life by intentionally "doing nothing" than by some positive action which unintentionally causes death. We can introduce safer motor cars up to a point, but eventually the only way to further safety is to give up your car, and most people decide that the risk is worth it, even though it is the second most important cause of

Modern agriculture depends heavily on fertilizers, new insecticides and plant growth substances (*photo courtesy of Plant Protection Division, ICI*).



untimely death in the developed countries.

An over-reaction against "chemicals" can do more harm than the disasters themselves. One can congratulate the food and drug laws of the United States for being so strict that that country avoided the thalidomide disaster. But other delays caused by these controls also condemned thousands of cardiac and other patients to suffering and even death. Such is the public ignorance of the most elementary facts about the natural world, about atoms and molecules and chemical substances, that reasoned explanation has little place in such things. A public which has become accustomed to scientific answers in black and white is not prepared to discuss technological risks in various shades of grey. And what on earth can we say to somebody who objects to having chemicals in his food?

Accepting that it is our destiny to live in a chemical world we had better learn some chemistry. How can we help people to understand that we are, ourselves, chemically constituted bodies, living wholly in a world of chemical substances, eating them, burning them, smelling them (for better or worse), and spending every second of our lives looking at them and manipulating them in some way or other: that every little bit of us is a chemical entity; all our living, illnesses and dying are chemical processes? One might as well try to do without chemistry as an attempt to stop the world and get off. Since it appears that the media, like television, which began with so much promise, are going to contribute little enlightenment, we must go look again to the teaching in our schools, particularly at the most elementary level. This will be one of the most important tasks for chemists in the next few decades.

An equally important task will be to get our politicians and policy makers (including, I have to add, some *scientists* who make policy) to understand the importance of chemistry.

How do we see the story?

But let us now turn to those of us who *have* learned some chemistry, how do *we* see the story? Some will say that chemists have had a good run, but cannot possibly keep the horn-of-plenty filled during the inevitable future population explosion. Let us consider the factors involved:

"Given the energy, the chemist can do anything."

(1) *The demographical evidence.* Birth rates are falling in almost every country in the world both as a result of the chemist's pill and of changing social attitudes. Death rates are also falling everywhere, as the killer diseases are conquered one by one and famine is gradually eliminated by better communication and an abundance of food. The former has not

caught up with the latter everywhere, and there is still a large imbalance in the newer developing countries, particularly in Africa. Most demographers predict that the population of the world must inevitably grow to about ten billion, or twice the present population, in the next century and will thereafter reach a steady state and then probably slowly decline.

"An over-reaction against 'chemicals' can do more harm than the disasters themselves."

(2) *The needs of the individual.* Food and fuel are the main essentials. The inorganic things that we need, the elements iron and copper, phosphorus and silicon, are permanent assets, though some will cost more to extract as they become more dispersed. The supply of the organic materials that we need for plastics and clothes, is limited only by energy. Again, carbon is indestructible but energy is needed to gather the fossil fuels or to extract it from carbon dioxide when the fossil fuels have gone.

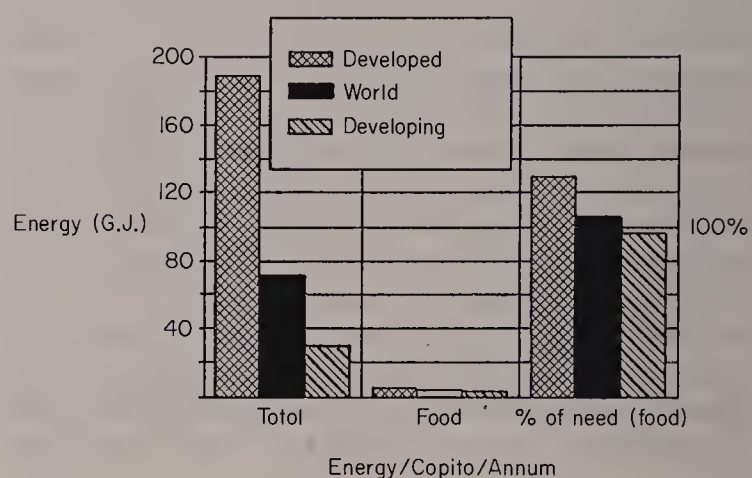


Figure 1.

So the whole thing boils down to *fuel* and that particular fuel called *food*. Given energy, the chemist can do almost anything but can he do anything about the energy supply?

For food, the world as a whole gets more than it needs, the developing countries slightly less than they need, though not seriously so on average (see Fig. 1). The developed countries eat 25% more than is good for them. To feed the projected *doubled* population would only require an increase in food production by 60% which should be possible by present methods, even on existing land.

With fuel, there is no easily measured "need" but it is well known that there is a close correlation between energy use and national wealth, measured as gross national product. And here the differences between developed and developing countries are very great.

There is no world surplus of *energy* and to bring all peoples' energy supply up to that of the average European, which might be thought of as a reasonable measure of need, we would have to increase the world energy supply by a factor of about 7, and by a factor of twice this, 14, for the projected future population. This is quite out of the question in the foreseeable future.

The present fuel situation is well known. If the developing countries were content with their present supply, (which, of course, they are not), there would be no immediate problem for *our* generation; but oil and gas will probably be exhausted in the next generation or two and coal in the following few generations. There may be difficulties earlier than this if, when these huge quantities of fuel are burned, the somewhat unpredictable effects of carbon dioxide and other combustion products on the atmosphere turn out to be adverse. In any case, the final solution has to be a very long term nuclear fuel or a renewable source, which means some form of solar energy conversion.

The chemist has an important part to play in all energy technologies, from isotope separation to combustion. But I am a photochemist and therefore, not unnaturally, I have a particular affinity for the method which has supplied nearly all our energy since life began, photosynthesis. Is it realistic to suppose that the whole of man's requirements can eventually be met from the sun's energy alone on a renewable basis?

There are three main possibilities:

(1) *Photosynthesis* of biomass is only about 1% efficient at best and, although genetic engineering in plants is likely to revolutionize the products that we can obtain from them, we cannot be certain that higher efficiencies will be economically attainable by this route. But there have been remarkable advances, even during the past year, in our understanding of the primary processes that occur in the reaction centre of the photosynthetic unit which will probably transform, eventually, our ability to manipulate the workings of the green plant.

(2) *Photochemical* methods, photosynthesis by artificial means such as the photolysis of water, are promising, and advancing rapidly. It will be surprising if economically reasonable efficiencies in excess of 10% are not attained but again we cannot be quite certain. The most exciting prospect for a wholly photochemical method would be to reduce nitrogen rather than to produce hydrogen gas, so that a continuous supply of fertilizer, made by solar irradiation *in situ* near the crop, could be trickled directly into the irrigation supply. This is one of the greatest challenges in the whole field of catalysis chemistry.

(3) *Photoelectric and photoelectrochemical methods*. As a result of recent developments, particularly in Japan, (of a process developed in the 1960s by Professor Walter Spears of Dundee University) we can be certain that large-scale conversion of solar energy at good efficiency is already possible. Amorphous silicon is deposited in multilayered structures on rolls hun-



Sir George Porter presenting his lecture at the Manchester Congress.

dreds of feet long. These already have efficiencies of more than 10% in small areas and a possible practical efficiency double this. By electrolysis of water this gives the best route to the photoelectrochemical production and storage of chemical fuels.

The applications are small scale at present, but pragmatic people like Richard Evans, business development manager for the photovoltaics division of BP, referring to the imminent breakthrough in cost, says "It is not a question of if — but when and by whom". Dr Zoltan Kiss, the President of Chronar, a US company which already manufactures amorphous silicon cells at Bridgend, South Wales, estimates a direct manufacturing cost of less than US-\$2/peak watt, and companies like Sanyo, and Sharp, have estimated a break-even date for economic large-scale energy production from solar photovoltaic cells within the next decade. If this is even approximately correct, it could become the biggest industry, and the most important innovation of our civilization over the next century. And, although the photovoltaic effect must be allowed to the physicists, nearly all the problems of development and manufacture of these cells are chemical and photochemical ones. In particular, the deposition of amorphous silicon on these films, from a vapour of silicon hydrides and fluorides, involves complex free radical chemistry the details of which are vital to the photophysical and photochemical properties of the material produced.

World resources of solar energy and energy needs

These developments are already having a small impact, in specialized applications, in the sophisticated technological countries, but can they provide the energy cornucopia for all mankind that we so much desire?

The average insolation, day and night, winter and summer, over most parts of the populated world is more than 200 W m^{-2} . At present the world population, 4.2 billion, consumes energy at a rate of 2.4 kW/person (76 GJ/annum) or a world rate of 10 terraWatts. The area required to provide this from the sun at 10% efficiency is therefore $500 \times 10^9 \text{ m}^2$ or 50 million hectares. This is to be compared with $1400 \times 10^6 \text{ ha}$ of cultivated land, $1700 \times 10^6 \text{ ha}$ of desert and $13\,000 \times 10^6 \text{ ha}$ total land (See Fig. 2). By using an additional area only 3% of that used to grow our food, we would be able to provide, on a renewable basis, the present power consumption of all people.

So we really have a potential *chemical cornucopia*. Given the energy, the chemist can do anything. And the energy is available, for the present, from chemical and nuclear fossil fuels and then, when needed, from photochemistry.

Chemistry can and does, therefore, contribute to our health and to our wealth. But what about our happiness? Linus Pauling once said that technology cannot make people happy but it can remove many causes of unhappiness. And the material contributions from chemistry prevent a great deal of unhappiness, by the removal of pain and hunger. But is this enough? Surely we need more, to make us happy, than the food, and material wealth which chemistry can provide. It is one of the main criticisms levelled against science that it contributes nothing towards our spiritual life and real happiness. But *are* the contributions of chemistry wholly material? Is there not also real happiness to be gained from it?

I started doing chemistry when I was very young, about nine or ten, and it was not for any material benefits that I might derive, nor even because I saw my future employment in chemistry. I collected crystals with the same enthusiasm that some boys collect butterflies, flowers or bird eggs. It was because I enjoyed growing beautiful crystals, making many-hued solutions, some of which could be made to change their colours magically and, perhaps most of all, I loved a good explosion.

I have discovered that I was not alone in this; many chemists whose work today seems to be highly sophisticated tell me that it was these simple attractions of chemical substances which brought them into chemistry in the first place. Whether all this can be called spiritual enjoyment I don't know, but it is far removed from the cold, purely utilitarian subject which many people see as chemistry.

The beauty of nature, seen by the chemist, lies in the materials with which he works. *Art and beauty are about form and colour, which chemistry has in abundance.*

From its beginnings in alchemy, chemistry has been associated with 'fire, flame and combustion. Pyrotechnics are an art form in themselves, the only chemical one incorporating the sense of sound as well — Oh! the joyful music of their crackers and whistlers

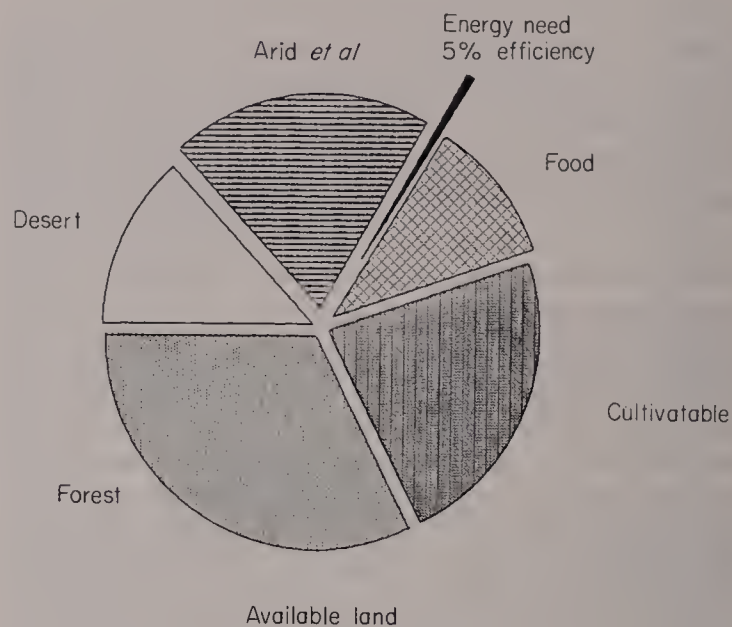


Figure 2.

and bangers! Then there is form, shape and symmetry, which are what both art and chemistry are about. This is most immediately apparent in crystals. Under the *microscope*, and especially in polarized light, a new world of form and colour appears. The shape and symmetry of substance is a reflection of their inner structures which have a beauty of their own, not to be seen directly, but imagined, drawn and sculptured by the chemist as space-filling models.

Who will not agree that chemistry is beautiful? But if the pictures are drawn by a computer, from instructions given by nature, and there is no artist, can there be art? That is also true of a flower, the beauty is in Nature Herself, and the chemist merely has the great pleasure and privilege of finding it out.

What of the future?

Chemistry has been so successful that there are probably no further stable *elements* to be discovered. With a large effort, almost any stable *molecule* could be synthesized. Many areas of chemistry seem to be almost completely known, and sometimes it is hard to imagine what really new ones there can be. Some people, even some chemists, ask whether chemistry is not becoming worked out.

But new areas appear all the time. Other sciences are being transformed into branches of chemistry. The brain is becoming recognized more and more as a chemically controlled organism, where neurotransmitters like acetylcholine and dopamine are all important and there is real hope that understanding them will lead us to an understanding and eventually to a cure of dreadful disorders like Parkinson's disease, Alzheimer's disease, schizophrenia, senile dementia and strokes.

In *archaeology*, modern methods of analysis of

minute quantities of materials are making it possible to discover our past in increasing and incredible detail. By chromatographic analysis of the paints and varnishes of an old picture, not only the date but the olive grove that the oil came from can be ascertained. We may even be able to examine the genetic make-up of our long dead ancestors by sequencing their DNA. And the sensitivity of isotope mass spectrometry and resonant ionization spectroscopy makes possible the dating of such small samples that we may be able, one day, to date the Turin shroud without the owners noticing that anything is missing.

The
beauty
of
chemistry.



In *cosmology* there is also *cosmochemistry*, the chemistry of *interstellar and intergalactic space* of the planets, meteors and comets, with all its implications about the origins of life and the biological possibilities not realized by our own planet.

The heart of chemistry itself is continually being renewed. In the last decade we have seen such a renaissance of *surface chemistry*, Langmuir Blodgett molecular films and organized layers that it is a new science, with all its applications to catalysis and solid state electronic devices. The once unfashionable *colloid chemistry* is now the heart of biochemical studies as well as polymer technology.

New *materials* appear all the time, such as *liquid crystals*, *amorphous metals*, *composite ceramics* and the wealth of new *organometallic* compounds, including crown ethers, zeolites, cryptates and all sorts of "holey" and (unholy) molecules.

Above all, at the limit of complexity, most of them still to be tackled by isolation and structure determination, come the biological systems, with organized assemblies of many molecules, with their super molecules and weak bonds, the non-covalent bonds.

To me, the most exciting recent development has been the unravelling of the structure of the apparatus which effects the first steps of photosynthesis. The primary processes of photosynthesis are light harvesting followed by the excited state chemistry of the reaction centre.

The elucidation of the structure of the reaction centre of photosynthetic bacteria (*Rhodospseudomonas viridis*) by Huber, Michel, Deisenhofer and others¹, is the botanical equivalent, in importance, of the solution of the haemoglobin structure.

By confirming the order of the electron transfer components, which had been predicted from time-resolved picosecond spectroscopy by Holten, Parson, Windsor and Thornber², both the structural and the kinetic work have become classics of modern chemistry. Here one is studying the structure, and the chemical kinetics, not so much of a large molecule, but of a whole biochemical factory.

The structure determinations of the light harvesting complex of the leaf by Kuhlbrandt were made by image analysis electron microscopy of two-dimensional crystals. These are at lower resolution (20 Å) but are perhaps the harbinger of similar success in structure and kinetic elucidation of the light harvesting antenna.

These are the portents of greater advances to come in our understanding of the photochemistry of the plant world. And alongside all this analysis come comparable developments in the laboratory synthesis of the components of these photosynthetic factories. At present this is being done using mainly covalent bonds to make diads and triads, like diads of porphyrins, porphyrin-quinones, porphyrin-viologen, porphyrin-crown ethers and the triads of quinone-porphyrin-carotene, first synthesized by Thomas Moore, Devens Gust and others at Arizona State. These extend the lifetime of the electron transfer complex from picoseconds in the porphyrin-quinone diad to microseconds in the triad, by extending the distance through which the electron has to tunnel in the back (not reverse) reaction. More realistic, but also more equivocal are the attempts to build similar organized molecular structures within membranes and bilayers as nature does.

There can be no end to chemistry for a very long time, and chemists will never retire until they have done all that is *possible* to understand life itself.

But how much is possible, and how much is beyond chemistry? My own view is that we shall never know the answer to that question until we try, and there is no logical reason to suppose at present that chemistry has any limits at all. Time and time again limits have been proposed, such as when a vital force was thought to be needed to synthesize organic compounds; a supposition disproved in the only way possible by synthesizing one without a vital force, as Wöhler did in 1828 when he synthesized urea from ammonium cyanate.

Chemistry and the other sciences can, and I believe will, eventually provide all man's essential needs. But we shall not then stop doing chemistry, because we do it for other than material reasons. We do chemistry so that we can better understand our world and ourselves. Some of us do chemistry because we can't help it: most of us do chemistry because we enjoy it.

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Committee on Chemistry and Industry (COCI)

Introduction

The International Union of Pure and Applied Chemistry (IUPAC) was founded in 1919 to represent chemistry at the international level. Its initial aim was to encourage chemists to standardize appropriate nomenclature, symbols, units and terminology, and also to develop and adopt appropriate chemical standards and methods. Over the years, a greater proportional emphasis has been given to applied subjects, and the way and desirability of industrial participation in this development is the subject of this paper.

As an international grouping of national organizations throughout the world representing chemists and chemistry, IUPAC covers all fields of academic, industrial or social relevance. In doing so it fosters the exchange of ideas and information through an extensive policy of publications and international meetings. These features are vital to all aspects of chemistry, be they academic, industrial, or commercial. They thus cover not just chemical industry, but all industrial, governmental, institutional and academic activities in which chemistry plays a role. IUPAC has an annual budget of about US-\$550 000 and a core membership of eight staff and about 300 Titular Members. Approximately 1400 people currently participate in its activities.

Organization

IUPAC is governed by a Council in which 42 countries are presently represented (see Organization Chart). An Executive Committee and Bureau, supported by the Executive Secretary and Secretariat, coordinate the activities of the seven subject Divisions and their Commissions. There are also seven special standing committees with a broad responsibility to advise the Bureau directly on:

- Chemistry and Industry (COCI)
- Finance (FC)
- Nomenclature and Symbols (IDCNS)
- Publications (PC)
- Teaching (CTC)
- Chemical Research Applied to World Needs (CHEMRAWN)
- Chemical Databases (CDB)

Activities

As might be expected from its roots, the activities of the Union were initially biased towards topics of scientific interest, such as the determination and standardization of atomic weights. Nevertheless, even

at the first meeting in Rome of the General Assembly (1920), a Consultative Committee with representatives from 38 specific areas (the majority of industrial interest) was inaugurated. These areas ranged, for example, from Factory and Laboratory Equipment, through Fermentation, Pharmaceutical and Photographic processes, to Petroleum and Hydrocarbons.

This early interest in applied and industrial topics is now channelled through the Committee for Chemistry and Industry (COCI), which is responsible for advising the Bureau on industrial topics requiring attention. These can be handled, for instance, within the Applied Chemistry Division (Air Chemistry, Water Chemistry) or through new groups such as CHEMRAWN (*CHEMical Research Applied to World Needs*).

Importance of Industrial Support and Participation

Through its publications, symposia, and close representational links with international governmental organizations such as WHO, FAO, UNESCO, OIML, ISO, EEC*, the Union has considerable leverage in legislation, standardization, codes of practice, and in information dissemination and exchange in areas featuring chemicals and chemistry. Similarly industry has an important role and self-interest in influencing IUPAC activities by participating in them when relevant to its own needs. IUPAC welcome this participation as it helps to ensure that its own programmes are timely and effective.

Ways of Participating

Representation in IUPAC is through the National Adhering Organization (NAO) of the country concerned. This is often the National Academy of Sciences or equivalent body. Individual companies are sometimes members, directly or indirectly, of various committees of the NAOs, and as such can use this channel of representation. However, this is often heavily diluted by the many other interests of the National Organization.

IUPAC has therefore encouraged the development

*WHO	World Health Organization
FAO	Food and Agriculture Organization
UNESCO	United Nations Educational, Scientific and Cultural Organization
OIML	L'Organisation Internationale de Métrologie Légale
ISO	International Organization for Standardization
EEC	European Economic Community

of national industrial or company groupings (known as Company Associates) whose objective is to highlight those areas of chemistry of interest to their operations. Company Associates in one country can send a representative to COCI and thus have a direct input into IUPAC, via COCI, to the Bureau and hence the Executive Committee and Council. A list of current Company Associates is shown below.

The relevance of IUPAC to the industrial world, and

the quality of its influence relative to the needs and operations of industry are very dependent on this type of participation. The small financial contribution entailed in its support is not a significant burden in terms of the benefits obtained or the consequence of defaulting by failing to provide an input into IUPAC.

For more information contact: Dr M. H. Freemantle, IUPAC Information Officer, 2-3 Pound Way, Cowley Centre, Oxford OX4 3YF, UK.

Major IUPAC Reports and Recommendations

Compendia of Recommendations on:

Physicochemical Quantities and Units (Green Book)

Nomenclature of Inorganic Chemistry (Red Book)

Nomenclature of Organic Chemistry (Blue Book)

Analytical Nomenclature (Orange Book)

Macromolecular Nomenclature (Purple Book)

Solubility Data Series (23 volumes issued so far)

International Tables of the Fluid State (8 volumes so far)

Standard Potentials in Aqueous Solution

Handbook of Thermodynamic and Transport Properties of Alkali Metals

Recommended Methods for Purification of Solvents and Tests for Impurities

Recommended Reference Materials for Realization of Physicochemical Properties

Standard Methods for Analysis of Oils, Fats, and Derivatives

Bibliography on High Temperature Chemistry and Physics of Materials

Symbols with Units Recommended for Use in Biotechnology

Element by Element Review of their Atomic Weights

Separation and Preconcentration of Trace Substances

Collaborative Interlaboratory Studies in Chemical Analysis

Safe Use of Solvents

Computers in Chemical Research and Education

Teaching School Chemistry

Cationic Polymerization and Related Processes

Chemical Toxicology and Clinical Chemistry of Metals

Current Trends in Organic Synthesis

Future Sources of Organic Raw Materials

Chemistry and World Food Supplies

Company Associates

Arab Republic of Egypt

Arab Co for Drug Industries & Medical Appliances
El-Nasr Pharmaceutical Chemical Co
NODCAR

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Atanor

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Ontario Research Foundation
Polysar Ltd
Pulp & Paper Research Institute of Canada
Sherritt Gordon Mines Ltd
Union Carbide Canada Ltd
Warner Lambert Co. Canada Inc
Xerox Research Centre of Canada

China

Chinese Petroleum Corp
Taiwan Fertilizer Co Ltd
Union Chemical Laboratories
USI Far East Corp

Czechoslovakia

IRAPA
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Denmark

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United Breweries

Federal Republic of Germany

BASF AG
Bayer AG

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Chemische Werke Hüls AG
Degussa AG
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Hoechst AG
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Schering AG
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France

CECA SA
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Kodak-Pathé SA
L'Oréal SA
Rhône-Poulenc SA
Roussel Uclaf SA

Greece

General State Chemical Laboratories

India

Indian Petrochemicals Corp

Ireland

Loctite (Ireland) Ltd
Warner-Lambert (Ireland) Ltd

Israel

Koor Chemicals Ltd

Italy

Gruppo Lepetit SpA
Montedison SpA

Japan

Ajinomoto Co Ltd
Asahi Chemical Industry Co Ltd
Asahi Glass Co Ltd
Banyu Pharmaceutical Co Ltd
Bridgestone Tire Co Ltd
Chugai Pharmaceutical Co Ltd
Daicel Chemical Industries Ltd
Daiichi Seiyaku Co Ltd
Daikin Industries (Kogyo Co) Ltd
Dainippon Pharmaceutical Co Ltd
Eisai Co Ltd
Fuji Photo Film Co Ltd
Fujisawa Pharmaceutical Co Ltd
Hitachi Ltd
Ihara Chemical Industry Co Ltd
Japan Spectroscopic Co
Kao Corp. (Soap Co Ltd)
Konishiroku Photo Ind Co Ltd
Kumiai Chemical Industry Co Ltd
Kuraray Co Ltd
Kureha Chemical Industry Co Ltd
Kyowa Hakko Kogyo Co Ltd
Meiji Seika Kaisha Ltd
Mitsubishi Chemical Industries Ltd
Mitsubishi Gas Chemical Co Inc
Mitsubishi Petrochemical Co Ltd

Mitsubishi Rayon Co Ltd
Mitsui Toatsu Chemicals Inc
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Nippon Carbon Co Ltd
NEC Corp
Nippon Mining Co
Nippon Steel Chemical Co Ltd
Nippon Steel Corp
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Taisho Pharmaceutical Co Ltd
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Netherlands

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African Explosives & Chemical Industries Ltd
SASOL
Sentrachem Ltd

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Switzerland

CIBA-GEIGY AG
Firmenich & Co AG
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Nestlé Alimentana
Sandoz AG

United Kingdom

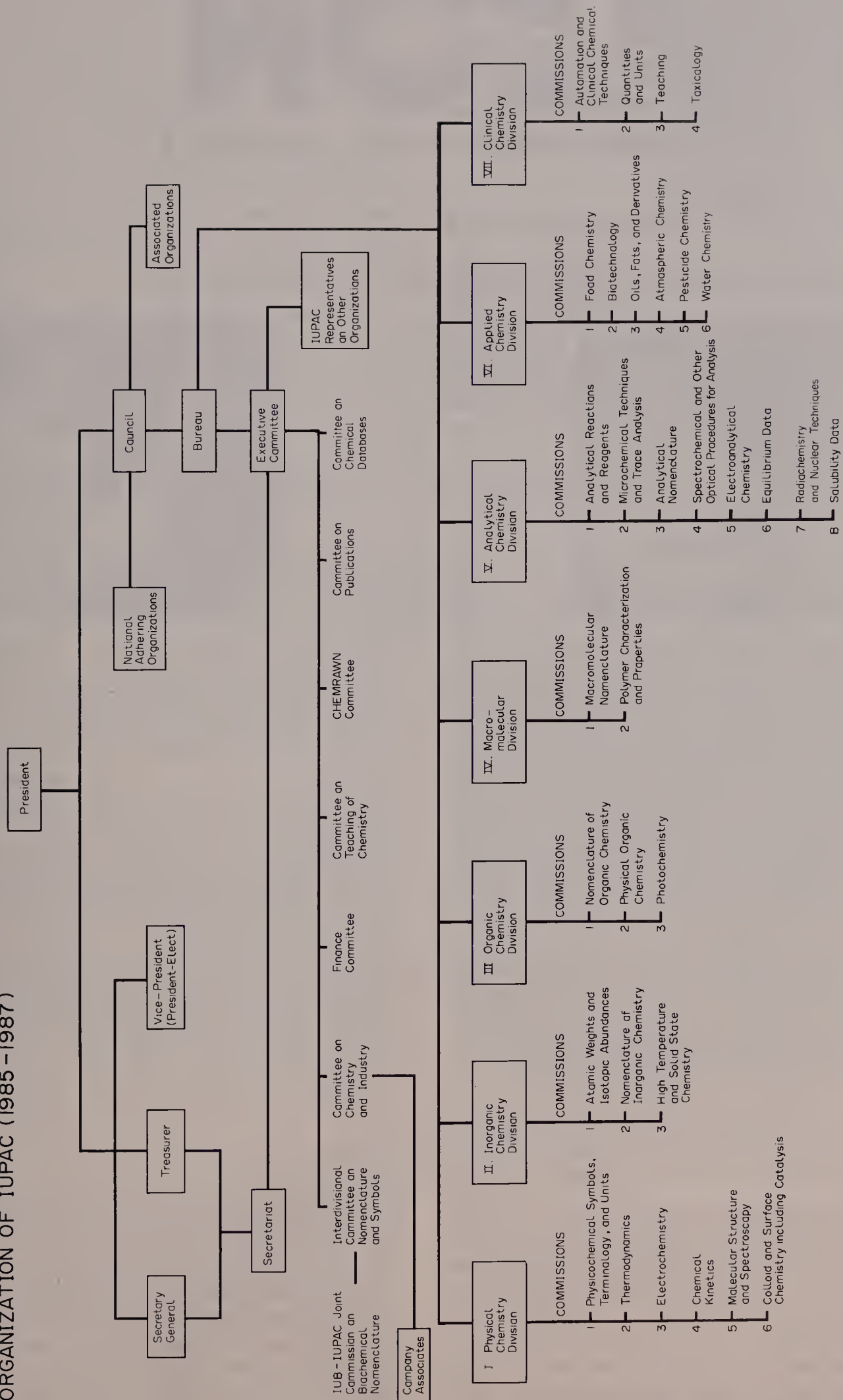
Beecham Pharmaceuticals PLC

British Petroleum Co Ltd
Burmah-Castrol Co
Cole Group PLC
Esso Petroleum Co Ltd
Glaxo Holdings PLC
Imperial Chemical Industries PLC
Laporte Industries Ltd
Monsanto PLC
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Wellcome Foundation Ltd

United States of America

Allied Corp
American Cyanamid Co
Amoco Chemicals Corp
BASF Wyandotte Corp
Celanese Research Co
CIBA-GEIGY Corp
Clorox Co
Corning Glass Works
Dow Chemical Co
Eastman Kodak Co
E. I. du Pont de Nemours & Co Inc
Exxon Research & Engineering Co
FMC Corp
B. F. Goodrich Co
W. R. Grace & Co
GTE Laboratories Inc
Gulf Research & Development Co
Hercules Inc
Hoffman-La Roche Inc
IBM Corp
ICI Americas Inc
S. C. Johnson & Son Inc
3M Co
McNeil Pharmaceutical
Merck, Sharp and Dohme Research Laboratories
Milliken Research Corp
Mobil Research & Development Corp
Monsanto Co
Owens-Corning Fiberglass Corp
Perkin-Elmer
Pfizer Central Research
Philip Morris USA
Polaroid Corp
PPG Industries Inc
R. J. Reynolds Industries Inc
A. H. Robbins Co
Rohm and Haas Co
Schering Corp
Shell Development Co
Smithkline Beckman Corp
Standard Oil Co (Indiana)
Standard Oil Co (Ohio)
UOP Group, The Signal Co Inc
Upjohn Co
Velsicol Chemical Corp
Warner-Lambert/Parke-Davis
Pharmaceutical Research Co
Westinghouse Electric Corp

ORGANIZATION OF IUPAC (1985 – 1987)



LYON

Rendez-vous with chemistry!

Champagne launch for IUPAC *Standard Potentials in Aqueous Solution**



IUPAC President, Dr W. G. Schneider (right) cuts the ribbon off the first copy presented by Mr P. D. Gujral.



The President with Editor, Prof. J. Jordan, looks admiringly through the pages.

Conceived at the General Assembly in Warsaw (1977), the project had just started to take off in Davos (1979) when I met the three Editors. The cool but firm Allen Bard never budged a dollar from his conviction that the successor to "Latimer"† must be available to chemists at less than US-\$30. Following a preliminary talk with Pergamon representatives, price proposals were invited from several publishers (a couple carried out market surveys) for the hardbound typeset book, which at the time was expected to make under 500 pages.

The next opportunity for us all to meet was at Leuven (1981). Authors had been commissioned by Bard and reviewing process finalized by Joseph Jordan. By the Lyngby (1983) General Assembly, Roger Parsons (then living in France) had received most of the manuscripts and had edited several. Still no publisher! Bard, in particular, would put his foot firmly down . . . printing from typescripts not suitable because of the

need to present symbols properly . . . any price above \$30 not acceptable. Other Editors verdict to Bard: You find a publisher — and he did.

In spite of the 834 pages, the book is priced at US-\$29.95.

P. D. Gujral

**Standard Potentials in Aqueous Solution*

Editors: Allen J. Bard, Roger Parsons and Joseph Jordan, Marcel Dekker Inc, New York, 1985, xii + 834 pp.; ISBN 0-8247-7291-1

†*Oxidation Potentials (or The Oxidation States of the Elements and Their Potentials in Aqueous Solutions)*, Wendell M. Latimer, first published 1938; last revised 1952, Prentice-Hall Inc, New York.

Clashes in IUPAC-Sponsored Symposia

In 1985 IUPAC sponsored 29 symposia. A similar number are expected in 1986. Many of these occur in August or September each year. As a result there have been some inevitable clashes where two or three conferences are held at the same time. This is not a problem when their topics are widely differing but problems can arise when two or more conferences are on related topics. Experts in the field cannot attend two different conferences at the same time and sometimes there is competition

between the organizers to obtain prominent scientists to lecture.

Representatives of the seven Divisions of IUPAC therefore met under the Chairmanship of Prof. J. Mathieu (France) during the General Assembly at Lyon to discuss this problem. The meeting agreed that Divisions should more actively inform each other of their proposed sponsored symposia. Each Division, it was suggested, should collect information from the Commissions concerning future

IUPAC conferences and compile these in the form of a list to be circulated to other Divisions. The meeting reaffirmed, however, that the responsibility for timing should lie with the conference organizers. Wherever possible, the organizers should be informed of the dates of future IUPAC conferences and possible clashes.

Prof. Mathieu pointed out that a high proportion of conferences occurred in Western Europe whereas in other parts of the world only a few, or none at all, occurred. Several speakers stressed that every effort should be made by the IUPAC Divisions to encourage more conferences in Third World countries.

Methods of avoiding the predominance of summer conferences were also discussed. Conferences are often held during this period because participants accommodation in university dormitories is available. However, it might be possible to sche-

Prof. J. Mathieu,
Chairman of the
Committee considering
clashes in IUPAC
Symposia.



dule more meetings in February during breaks between semesters. This would have the added advantage that participants would be able to benefit from low season air fares. However, they recognized that the weather at that time in some parts of the world would be less pleasant.

M. H. Freemantle

Lyon Council Reports

Biennial Reports of the Division Presidents (1983/85)

IV. Macromolecular Division

Commission IV.1. Macromolecular Nomenclature

All ISO standards have now been collected in handbook form; Volume 1, published in August 1984, includes definitions of interest to the Commission. Close contact will be maintained with ISO on the matter of approved abbreviations, which are of special interest to the largely industrial membership of ISO.

The main task before the Commission at the present time is the production of recommendations for definitions of terms relating to physical properties, specifically for (i) crystalline polymers, (ii) individual macromolecules, their assemblies and dilute solutions, and (iii) bulk polymers. The work is being tackled by three working parties, one for each subdivision, as well as by the Commission as a whole.

The meeting of the Commission in Prague was able to complete a document on crystalline polymers, make substantial progress on the macromolecules, assemblies and dilute solutions chapters and give general consideration to the part dealing with bulk polymers. The document on crystalline polymers will be sent to IDCNS in accordance with current publication procedure. The dilute solutions paper will be completed at the 1985 meeting, and possibly the bulk polymers recommendations may be finalized at the same time. The production of this set of recommendations should count as a major achievement.

The Compendium ("Purple Book") is well on its way

now, the last administrative barriers apparently having been demolished. Further good work has been done on terms for reactions involving chiral compounds. Members of Commission IV.1 were responsible for suggesting some very helpful new terms at an interdivisional meeting on Stereochemistry at Lyngby and the part pertaining to polymerization should shortly appear for approval and publication. The Commission completed two documents in 1983, two in 1984 and will probably complete another two in 1985.

Working Party IV.2.1. Structure and properties of commercial polymers

This continues to be the most active working party and has 33 participants together with subgroup membership — five in Eastern Europe and 12 in Japan. Membership in North America was recently extended to include the Boeing Aircraft Corporation and the University of Waterloo, Canada.

Studies in progress or recently completed include the following:

- (i) "Stability of Elongational Flows of Molten Poly(ethylene terephthalate)".
- (ii) "Stability of Elongational Flows of Molten Polyethylene".
- (iii) "The onset of runaway creep in HIPS".
- (iv) "Impact Testing of Polypropylene Mouldings".
- (v) "Application of Fracture Mechanics to the Prediction of the Ductile-Brittle Transition".
- (vi) A full account of the work of the subgroup on "The estimation of the molecular defects in PVC and

their effect on thermal stability" is to be published as seven papers in the *Journal of Vinyl Technology*; only the summary will appear in *PAC*.

(vii) "Mechanical Characterisation of long carbon-fibre thermoplastic composites". It is expected to be completed in 1987.

(viii) Subgroup IV.2.1.1 (Japan) continues to show high activity. A paper on the structure and properties of linear low-density polyethylene has been approved for publication in *PAC* and two other papers are at an advanced stage — one on long-term ageing effects on the mechanical properties of commercial polymers and the other on characterization of polyacrylonitrile-based carbon fibres. Other topics being studied include the structure and properties of high-vinyl polybutadiene rubbers and structure and dielectric properties of vinylidene fluoride copolymers.

(ix) Subgroup IV.2.1.2. (Eastern Europe) was inaugurated on 15 July 1983 and its membership has increased to five. The subgroup has participated in the activities of IV.2.1 on "extrusion instabilities of polyethylene"; it has also contributed to studies on the characterization of linear low-density polyethylene (IV.2.1.1 and IV.2.2).



Prof. C. H. Bamford (President) and Prof. M. Mandel (Secretary) of Division IV.

The subgroup is anxious to extend its participation to new projects initiated by Working Party IV.2.1; it has invited members of IV.2.1 to hold their 1985 meeting, together with a joint session with the subgroup, in Prague on the occasion of the 28th Prague Microsymposium "Polymer Composites". Regrettably, their offer was not accepted by the Working Party.

(x) New projects under exploration, but not formally initiated, include the following:

Viscoelastic properties of crosslinking epoxies.

Viscoelasticity and concomitant morphology in industrial polyblends.

Both the above have the enthusiastic support of the majority of members of the rheological section of the working party.

Flow behaviour of non-symmetrical fillers.

Liquid Crystal Systems. The Working Party has

interests in mechanical and rheological properties rather than preparative work, and sees a possible role alongside that of the proposed new Working Party on "Polymer Liquid Crystals".

Working Party IV.2.2. Molecular Characterization of Commercial Polymers

Continuing progress has been made on the major project "Molecular Characterization of Linear Low-Density Polyethylene". The subgroup on "The Characterization of Polyelectrolytes", which includes collaborative work in 15 laboratories, has produced a draft report for comment. A final report will be completed later this year. The project is expected to continue with a new polymer sample (provided by industry). The subgroup on "Characterization of Elastomers" is being reactivated.

Working Party IV.2.3. Supported Polymer Films

A meeting held in September 1984 at Lugano, concentrated on finishing current work and raising support for new projects. Among proposals for new activities are "Characterization of Cure of Coatings in Relation to Performance Properties" and "Use of Indentation Measurement for Elucidating Film Properties".

The final draft of a paper on "Analysis of Emulsion Paints" has been agreed for publication. A paper on "New Insight into the Process of Adhesion Measurements and the Interactions of Polymer Substrate Surfaces" is in course of publication. The first draft of a paper "Surface Structure and Structure" has been prepared.

Work on "Analysis and Stability of Systems containing Amino Resins" has encountered technical problems associated with the analysis of complex systems and also suffered from reorganization within participating industrial laboratories.

Working Party IV.2.4. Thermal Properties of Polymers

Eighteen laboratories are involved and results from 16 are now available on the project "Glass Transition Phenomena of Amorphous Polystyrene by DTA and DSC"; the first draft of a report is virtually complete.

A proposal for a new programme on "Crystallization and Melting Behaviour of Linear Low-Density Polyethylene" under consideration has been strongly supported. Also being considered is the formation of two subgroups on "Thermogravimetry" and "Thermal-mechanical Analysis", respectively.

Working Party IV.2.5. Kinetic Parameters for Free-Radical Polymerization

It was agreed to limit further work so that experiments were concluded by Autumn 1984. Papers being prepared will include "Densities of Monomer [methyl methacrylate] and Solutions of Polymer in Monomer", "Polymerization Rates and Molecular Weights", "Statistical Analysis of Rate Data" and "Treatment of Gel Permeation Chromatography Data".

The large content of scientific experimental work in its programme has beset this working party with logistical problems since its inception. Participation in the work in industrial laboratories is often discouraged since it interrupts activities or more direct commercial importance. Members agreed that the most profitable and practicable way of proceeding is on the basis of a computer-based project. This would involve modelling polymerization processes so as to provide information to assist experimentalists in devising critical experiments aimed at achieving a better understanding of polymerization processes. A possible topic which received general support arose out of the current programme. The working party agreed to submit a proposal to the Commission that a programme be established to examine the modelling of polymerization reactions with the aid of kinetic data and characterization techniques. Members felt that they should not attempt further definition but should leave the incoming Chairman to define the programme in conjunction with potential participants.

C. H. Bamford
President

V. Analytical Chemistry Division

The purpose of this report is to review the activities of the Analytical Chemistry Division since the 32nd General Assembly (Lyngby 1983) and up to May 1985. The synthetic aspect of the work carried out by the eight Commissions and Subcommissions of the Division and its importance in the context of development of analytical chemistry is considered. Some new directions have been a subject of reflection, and the role of the Division in the actual and future developments of analytical chemistry are mentioned with a particular view to the programming of projects such as chemometry, data bases, biotechnology and the participation of the division in these fields.

1. General Activities of the Division

1.1. Introduction

The Divisional Committee has played its usual role in the examination of the work of the Commissions with a view to its forwarding for publication, via the IDCNS if

necessary. A certain speeding up of the various studies has been observed due to the fact that the Members of the Divisional Committee predominantly follow the work falling within their respective scientific fields and have taken part in the elaboration or development of projects in the course of publication. A speeding up of the clearing process, without prejudice to the quality of reviews, could, however, certainly be achieved: the Executive Committee of the Division will examine these questions in Lyon.

1.2. Division Projects

The three projects coordinated by the Division have progressed satisfactorily since September 1985.

1.2.1. Orange Book. The material for the second edition of the *Compendium on Analytical Nomenclature* (Orange Book) is now nearly complete.

1.2.2. Methods for the Determination of Trace Element in Natural Waters. This project, which involves the work of the Commissions of the Analytical Chemistry Division, was coordinated by Prof. H. W. Nurnberg who died in May 1985; he was a very active analytical chemist in the Division with an international reputation. All the Members of the Division of Analytical Chemistry acknowledge his devotion to the Division and his energy to serve the "Water project".

Prof. Nurnberg finalized the first volume in 1984; this volume contains a preface by F. Pellerin, and a preliminary chapter by Prof. Nurnberg. After an editorial revision by Prof. T. West, this book will be ready for printing; the second volume was finalized by Prof. Nurnberg in April 1985, and after editorial revision will be ready for printing. The important contribution of Commission V.4 will be assembled in the third volume on the subject of spectroscopic methods for trace element determination in natural waters. The contents of this book have been accepted; the texts of the chapters under finalization and harmonization by A. Strasheim and R. P. Butler will be ready for Lyon.

Finally, the "Water project" will be presented by group or type of method rather than element by element. This solution has the advantage of displaying the work carried out by each Commission; also, the reader will be able more easily to choose the methods he can use as a function of the instrumentation available to him and the sensitivity required. In this form it would seem that the publication will provide a service to the analytical chemist and offer a vast documentation on the theoretical and applied aspects of the analysis of trace elements in natural waters and in the various domains of chemistry, of life and of the environment in which these problems arise.

1.2.3. Multilingual Dictionary. Professor Pungor, the Coordinator of this inter-Commission project, has

undertaken a choice of terms to be defined and has made translations into various languages. A specimen of the document, with its several translations have been examined by the Executive Committee of the Division. Some problems have to be considered. The *Multilingual Dictionary* is based on the index of the first edition of the Orange Book; a translation of this index is not sufficient and a definition of each term in English should be available. Taking into consideration the great amount of work which was to be done by many contributors and the importance of the document, the Division Committee will have to discuss in Lyon its significance for the Division and the Union, the scientific aspects and the need that this dictionary represents for the international community of analytical chemists.



Prof. F. Pellerin,
President of Division V.

2. Summary of the Activities of the Commissions

The activities of the different commissions are summarized and the various projects under way are listed in the Current Programme; in addition the list of publications issued by the eight Commissions of the Division are shown in an Appendix to this report. The Commissions held a mini meeting in 1984 to review ongoing studies.

2.1. Commission V.1

Commission V.1 held a meeting after the Euroanalysis V in Cracow. Some projects were discussed and will be finalized in Lyon; they provide evidence of the work of Commission V.1 in the field of new reagents and the new applications of the organic reactions in analytical chemistry. The following projects are in progress or will be proposed in Lyon:

- Classification of interferences
- Metal buffers in chemical analysis
- Analytical application of crown ethers
- Present status and Perspectives of Organic Analytical Reagents
- Characteristics of Stationary Phase for GLC and HPLC

2.2. Commission V.2

The Commission has been very active in the field of inorganic trace analysis. Various reports have been published and others are in preparation. Commission V.2 considers the whole field of general trace analysis as very important.

After the Lyngby General Assembly, a subcommission on organic trace analysis started its activity. It was decided that the best approach would be to start with general reports which would fit best into the Commission's tradition. These reports will describe errors and pitfalls commonly encountered in the various steps of the analysis, the choice of equipment and the advantages and disadvantages in terms of capital, maintenance or labour investment. These reports will be illustrated with examples taken preferentially from environmental or food analysis.

The next stage would be the application of the general reports to the analysis of various important organic trace components, of which the organo-halogen compounds seem to be the most urgent.

The working group on surface analysis has adopted its working programme along the lines set out at Lyngby meeting. The group will meet in Cracow (1 September) to discuss the priority areas and possible new projects. In the meantime, the preparation of reports on standards and calibration for surface analysis continues.

2.3. Commission V.3

Finalized projects. The projects, finalized at Lyngby, have been submitted to the Division President for publication.

Joint Meeting with Commission VII.1. A meeting was held on 3 May 1984 in Rio de Janeiro, where G. G. Guilbault met three representatives of VII.1. They discussed all the three parts of the newly started project on Nomenclature of Bioanalytical Methods (I. General Nomenclature, II. Classification of Analysers, III. Projects Encountered with Carryover).

Preparation for the Interim Meeting. A meeting was arranged for 28 October 1984, in Washington DC to coincide with the Centennial Celebrations of the AOAC and with the second Harmonization of Collaborative Analytical Studies Symposium. All the Titular Members, most of the American and three of the European Associate Members were present. All the projects were reviewed and the future activities of the Commission discussed, particularly the topic of harmonization of terms in analytical collaborative studies.

2.4. Commission V.4

The Commission reviewed ongoing studies during a mini-meeting in 1984. In April 1985, the 2nd Inter-

national Symposium on Analytical Chemistry in Exploration Mining and Processing of Materials was held in Pretoria (15–19 April 1985). It was sponsored by IUPAC and successful.

The Commission has prepared a particularly important report in the framework of the Division's Water Project. This report is reviewed by A. Strasheim and L. P. Butler and will be ready for Lyon. It constitutes the third volume of the Water Project and is a very important example of the contribution of spectral methods of analysis to the determination of element traces of metals in natural waters.

All the projects are on-going and the Commission is in liaison with other bodies, specialized in spectroscopy, such as IAU/IUCS.

2.5. Commission V.5

The contribution of the Commission to the development of electroanalytical chemistry is particularly important and the activity of all the members of the Commission and Subcommittee must be mentioned. From the last General Assembly in Lyngby, the activity of the Commission can be summarized under three items:

2.5.1. Publications of the Commission. Four reports have been published in PAC and three are now in press.

Standard Potentials of Amalgam Electrodes in Aqueous Solutions, Temperature Coefficients and Activity Coefficients of Metals in Mercury, The authoritative monograph *Oxidation–Reduction Potentials in Aqueous Solutions* is currently in press.

Nine reports have been submitted for processing by Division Committee. Camera-ready copies of the following two reports are being processed for publication in PAC:

Thermodynamic Functions of Transfer of Single Ions from Water to non-Aqueous and Mixed Solvents: 2. Enthalpies and Entropies of Transfer.

Thermodynamic Functions of Transfer of Single Ions from Water to non-Aqueous and Mixed Solvents: 3. Standard Potentials.

The Authorized Chinese Translations of the following reports have recently been published (Fujian Science and Technology Publishing House, PRC, 1985):

Classification and Nomenclature of Electroanalytical Techniques.

Status of the Faraday Constant as an Analytical Standard.

Recommendations for Sign Conventions and Plotting of Electrochemical Data.

Recommended Terms, Symbols and Definitions for Electroanalytical Chemistry.

Drafts have been prepared aiming at a consensus

concerning important controversies related to critical data compilations, namely

The Extrapolation of EMF Data to Infinite Dilution in non-Aqueous and Mixed Solvents.

Thermodynamic Functions of Transfer of Single Ions from Water to non-Aqueous and Mixed Solvents.

The Selection of Extrathermodynamic Assumptions.

These will be placed on the agenda of the General Assembly, for discussion in depth with Commission I.3 and other interested IUPAC bodies.

2.5.2. Subcommittee on Electroanalytical Methods of Environmental Trace Analysis.

Two reports have been included in Volume I of the "Water project" and the following reports are in progress.

Organic pollutants in water, biological materials and soils.

Trace elements in soil.

Applications of ion chromatograph to the determination of trace substances in aquatic matrices.

2.5.3. Programme Matters. The following topics were proposed as new commission projects to be initiated at the Lyon meeting.

Flow-Through Electroanalysis.

Ion Chromatography: The use of ion chromatography for anion analysis in aqueous samples; — Ion chromatographic detectors.

Mathematical Treatment of the Analytical Signals.

The Subcommittee on Electroanalytical Methods of Environmental Trace Analysis will put emphasis on the projects dealing with waste waters, biological materials and soils.

Finally the activity of the Commission V.5 can be summarized by its terms of reference:

To advise on matters relating to electroanalytical chemistry, in particular, to survey the status of research and development and promote the advancement of the field.

To make recommendations on relevant definitions, nomenclature, standards and standardization procedures.

To encourage and participate actively in the preparation and publication of authoritative reports and monographs including data tabulations and outlines of recommended procedures.

To initiate, sponsor and organize meetings and conferences on electroanalytical chemistry, either within the existing framework of IUPAC meetings, or as supplementary activities.

To act as an information and coordinating body for electroanalytical chemistry throughout the world.

2.6. Commission V.6

The activities of Commission V.6 are as follows.

The Commission V.6 had an informal meeting on 30 July 1984 in Boulder, Colorado, USA during the meetings of the 23rd ICCS. Subjects discussed there were:

Critical Survey Project: (i) The thiocyanate system will be completed soon; (ii) the cyanate system should be accelerated to be completed soon; (iii) the nucleotide system should be started immediately; (iv) the system of glycinate and other simple amino acid complexes will be started soon; (v) the polymer system proposed by Braibanti on behalf of Barbucci should be included in the work by Valenta.

Compilation of stability constants: Data collection has been already started and the compilers are making the software of the program.

Discussion of the proposal from Commission I.2 for standard pressure concludes that our Commission does not support the recommendation from the Commission I.2.

2.7. Commission V.7: Radiochemistry and Nuclear Techniques

After the approval of the Bureau meeting held in Oxford in September 1984, the Commission was reactivated in late 1984 under its present title. Members were added to represent interests of both the Physical Chemistry and Clinical Chemistry Divisions. Thus, the present composition of the Commission is multidivisional in nature. Many new ideas for new projects have been proposed and circulated among the membership of 11 Titular and Associate Members. These will be discussed and a new programme developed and finalized at the Lyon General Assembly. In addition, several national representatives have been proposed and accepted as well as observers who have indicated an interest in attending the General Assembly or to be kept informed of the work of the Commission.

2.8. Commission V.8: on Solubility Data

At the initiative of the Commission, the 1st International Symposium on Solubility Phenomena was held at the University of Western Ontario, London, Canada, 20–23 August 1984. Seven plenary and 39 contributed papers were presented to an audience of 72, about half of the participants coming from Europe. The plenary lectures are being published in *PAC*, and most of the contributed papers have been submitted for a centralized publication in the *Journal of Solution Chemistry*.

The Symposium was considered very successful, and in a general discussion at the Closing Session of the Symposium, the participants expressed the need for future meetings along the same lines. It has sub-

sequently been decided to hold the 2nd International Symposium on Solubility Phenomena at the New Jersey Institute of Technology, 12–15 August, 1986.

Negotiations for the renewal of the publication agreement with Pergamon Press are presently underway. Among other provisions, the Commission's proposal calls for Pergamon to finance a computerized production facility for all manuscripts of the Solubility Data Series.

The year was unusually productive in terms of number of volumes completed: eight volumes, a total of some 3000 pages.

The initial set of 18 volumes, covered by the first agreement with Pergamon, was completed in May/June 1984, with the submission of the manuscripts for three volumes: one on alcohols with water, editor Dr Barton, and two volumes on antibiotics: beta-lactams, editors Drs Tomlinson and Regosz. Since the completion of the set, the manuscripts of the following five volumes were approved for publication and submitted to the office of the Executive Secretary, awaiting the outcome of the contract.

F. Pellerin
President

VI. Applied Chemistry Division

This report is an update of the summary published in *CI*, No. 6, pp. 16–17, 1984.

VI.1 Food Chemistry

A tenth Working Group (on Effects of Food Processing on Food Components; the Working Group will limit itself to chemical changes related to food safety, such as non-enzymatic browning reactions, or allergens) was established at the 1984 meeting held in Washington DC, at the end of October. At this time, three active projects were successfully terminated, four active projects continued, two active projects revised, and two new projects approved.

VI.2 Biotechnology

This Commission will be entirely restructured (in terms of membership and projects) at Lyon.

VI.3 Oils, Fats, and Derivatives

The Commission met in Turku, Finland, 21–23 August 1984. Twenty-eight Members (Titular and Associate) and National Representatives were present. Twelve observers attended and eight international organizations were officially represented.

Three methods were definitively adopted:

Qualitative and quantitative determination of phospholipids in commercial lecithins.



From left to right: Dr B. C. Kearney (Vice-President), Dr H. Frehse (President) and Dr L. E. Coles (Secretary) of Division VI.

Determination of total and free hexane in oilseed cakes.

Determination of traces of copper, iron, and nickel in edible oils and fats.

Other projects are in continuation. No proposal for a new project has been made, but limited, unofficial working groups were set up concerning the determination of lead and other toxic metals in edible oils, and the adulteration of olive oil by semi-drying oils.

VI.4 Atmospheric Chemistry

The Commission held its first meeting 26–27 November 1984, in Lübeck, FRG. There were three broad areas to be covered by the new Commission:

- (1) Tropospheric chemistry,
- (2) Ambient (environmental) atmospheres,
- (3) Workplace atmospheres.

The principal objective of the Commission was seen to involve reviewing current sampling and analytical programmes for atmospheric chemistry as a whole in close collaboration with appropriate international experts. The intention would be to establish acceptable standards of air testing methods for use by all countries involved in carrying out the work. Harmonization of sampling protocols and analytical methods would permit more reliable comparison of data from the various monitoring agencies/researchers around the world. Such data could then be used with confidence for the preparation of global tropospheric chemistry system models.

It was felt that a number of working parties would be required. It was also envisaged that most members of such working groups would be taken from existing research groups and that some external (non-IUPAC) funding would be required to support these working parties. Some consideration of potential funding agencies would therefore need to be investigated.

It was also agreed to concentrate initial Commission efforts on the tropospheric chemistry projects and that

Project I should be put forward for official IUPAC approval. Work on this project would be started immediately with a view to completing the project prior to the Lyon meeting in September 1985. The information obtained from this project would form a useful data base for future projects.

The importance of liaising with members of existing research groups and commissions on tropospheric chemistry world-wide and to generally publicize the IUPAC commission's existence was emphasized. Reference to the Commission had already been made in the Global Tropospheric Chemistry Panel (GTCP) report (circulated at the meeting) and it would seem opportune to contact them now that the Commission was fully operational.

It was felt that there would be little point in duplicating the efforts of other groups or commissions, so it was important to identify the roles that the IUPAC Commission should play which would link in and be of value to all research programmes. It was felt that the proposed projects would meet that aim.

Seven projects are proposed as follows:

1. Inventory of current tropospheric sampling programs world-wide.
2. Evaluate current knowledge on important tropospheric trace gas concentrations world-wide and identify needs for additional measurements.
3. In cooperation with scientific representatives from various countries propose additional sampling sites.
4. Review of existing instrumental methods of analysis of selected tropospheric trace gases.
5. Workshops for scientific personnel involved in making measurements in the global sampling network to ensure equivalent standards and comparability of measurements.
6. A central data analysis group to collect, collate and analyse data from the network and distribute the data to participating laboratories.
7. Identification and study of trace gas and aerosol problems requiring further investigation in the industrial or laboratory environment.

VI.5 Pesticides Chemistry

Additional reports on pesticides (Microbial Adaptation to Pesticides, and Critical Evaluation of Model Ecosystems) were prepared for publication. The Commission feels that in view of the scope of its activities, the name Commission on Pesticides Science would be a more accurate designation for it.

VI.6 Water Chemistry

After approval having been given for the establishment of this Commission by the Bureau at its Oxford Meeting in 1984, the Division President proposed that a small number of the Commission Members held a preparatory meeting, well in advance of the General

Assembly. The purpose of the meeting should be to generate a tentative agenda, a working schedule for potential projects and their priorities, and to discuss other topics that might expedite the start and performance of the Commission meeting in Lyon.

This meeting was held in London, 8–10 March 1985. Before considering the suggested list of projects, there was a general discussion on the objectives of the Commission's work:

1. The Commission should concentrate on areas of work not being dealt with by other groups or organizations. Such work should result in recommendations on key topics; the preparation of definitive statements; production of guidelines, literature surveys and reviews; and the stimulation of relevant research.
2. The Commission should choose a few, environmentally important, issues that have not been dealt with adequately in the past, and carry out detailed studies, for example, novel wastewater processes to remove heavy metals.
3. The Commission should consider organizing international workshops, on the basis of restricted attendance by experts, dealing with important single topics.

It was agreed that a high priority item should be the removal of non-biodegradable substances and heavy metals from wastewaters by pretreatment processes. Final decisions on the initiation of individual projects will be made at Lyon.

Conclusion

The Division President's term of office ends with the Lyon General Assembly. He wishes to express his appreciation and gratefulness to all his colleagues within IUPAC who assisted him in fulfilling this exciting task. The Division has gone along a thorny road since Leuven, with the obligation to reestablish two new Commissions, and a third one subjecting itself to the need for considerable restructuring. It is with relief and regret likewise that the President departs from all these challenges. On that occasion, he apologizes to his fellow Division members whose many letters and desires he sometimes failed to respond to with the space of time they felt would have been commensurate to the importance of their problems.

H. Frehse
President

VII. Clinical Chemistry Division

Commission VII.1: Automation and Clinical Chemical Techniques

Commission VII.1 sponsored and helped to organize an "International Congress on Automation and New

Technology in the Clinical Laboratory", held in Barcelona, Spain, on 15–18 October 1984. The eleven plenary and symposium lectures at this congress were published in *PAC* (57, 543–602, 1985). A document entitled "Bioanalytical Nomenclature" has been approved by the Commission and is being reviewed by the Clinical Chemistry Division. A joint report from Commissions VII.1 and V.3 on "Nomenclature for Automated and Mechanized Analysis" has been approved by the Clinical Chemistry and Analytical Divisions and is currently being reviewed by IDCNS. A document on "Classification of Analyzers in Clinical Chemistry" will be considered in Lyon, and a document on "Carry-over Effects in Clinical Chemical Analyzers" is being drafted. Commission VII.1 and Commission V.3 are jointly revising a document on "Nomenclature for Electronic Data Processors and Microprocessing in Automated Analysis".

Commission VII.1's terms of reference have been revised, approved by the Clinical Chemistry Division, and forwarded to the Bureau. The Commission does not plan to embark on new activities until its existing projects have been completed.



Prof. F. W. Sundermann, Jr., President of Division VII.

Commission VII.2: Quantities and Units in Clinical Chemistry

Commission VII.2 published the following documents in *PAC*: (a) "Quantities and Units in Clinical Chemistry: Nebulizer and Flame Properties in Flame Emission and Absorption Spectrometry"; (b) "Physicochemical Quantities and Units in Clinical Chemistry with Special Emphasis on Activities and Activity Coefficients"; and (c) "Names, Symbols, Definitions and Units of Quantities in Optical Spectroscopy".

Draft documents on (a) "Nomenclature of Derived Quantities"; (b) "Glossary of Terms of Quantities and Units for Clinical Chemistry"; (c) "Classification,

Quantities and Units for Protein-Binding Assays in the Clinical Laboratory"; and (d) "Quantities and Units for Metabolic Processes as a Function of Time" are currently being reviewed by Commission VII.2 and/or IDCNS.

Commission VII.3: Teaching in Clinical Chemistry

Commission VII.3 completed the following documents, which are currently under review by the Division and/or awaiting publication in *PAC*: (a) "Guidelines for Teaching of Clinical Chemistry to Medical Students"; (b) "Guidelines for Effective Communication of Clinical Chemistry Laboratory Data"; (c) "Certification, Licensure and Accreditation Programs for Clinical Chemistry"; and (d) "Basic Education and Training Framework for Medical Laboratory Technicians in Clinical Chemistry". In addition, a "Reference Catalogue of Audio-Visual and Bibliographic Materials for Teaching of Clinical Chemistry" is being assembled, and a document on "Drug Effects in Clinical Chemistry: Educational Aspects" is being drafted.

Commission VII.4: Toxicology

Commission VII.4 and its subcommittees sponsored and helped to organize the following international symposia: (1) "Third International Conference on Nickel Metabolism and Toxicology", Paris, France, 4–8 September, 1984; (2) "International Symposium on Selenium", Beijing, China, 28–30 May, 1984; (3) "Symposium on Metabolism of Trace Elements Related to Human Diseases", Loen, Norway, 10–13 June 1985; and (4) "International Conference on Aluminium-Related Disease: Pathogenesis, Treatment and Prevention", Charlottesville, USA, 18–20 June 1984.



Prof. R. A. Alberty

The following documents and monographs have been published: (a) "Beta-2 Microglobulin and Other Urinary Proteins as an Index of Cadmium Nephrotoxicity", (*PAC*); (b) "Biological Monitoring of Occupational Exposures to Toxic Chemicals", prepared by A. Aitio & J. Jarvisalo (*PAC*); (c) "IUPAC Interlaboratory Survey on Cadmium in Whole Blood", *Fresenius Z. Anal. Chem.* **316**, 246–7, (1984); and (d) *Progress in Nickel Toxicology*, Blackwells Ltd. Interlaboratory surveys for collaborative harmonization of analyses of selenium, cadmium, aluminium, and other trace metals in urine and blood have been conducted by Y. Thomassen and colleagues.

Clinical Chemistry Division Committee

The Division Committee met in Paris, France, on 8 September 1984 to review the work of its Commissions and to coordinate extra-divisional activities. The Division continued its active collaboration with (1) the IUPAC/IUB Joint Commission on Biochemical Nomenclature; (2) the Interdivisional Commission on Nomenclature and Symbols (IDCNS); (3) *Chemistry International*; (4) the Working Party on Medicinal Chemistry; (5) the Interdivisional Program for Collaborative Analytical Harmonization; (6) the World Health Organization; (7) the International Federation of Clinical Chemistry (IFCC); (8) the International Union of Biochemistry (IUB); (9) the Commission on World Standards (COWS) of the World Association of Societies of Pathology (WASP); (10) the International Union of Pharmacology (IUPHAR); and (11) the International Union of Toxicology (IUTOX).

F. William Sunderman Jr
President

Next General Assembly to be held in Boston

The next IUPAC General Assembly will be held at Boston University, Massachusetts, 21–29 August, 1987. The organizer of the Assembly is Prof. Robert A. Alberty, Professor of Chemistry at Massachusetts Institute of Technology, Cambridge, Massachusetts, USA. Prof. Alberty is an Associate Member of the Commission on Physicochemical Symbols, Terminology, and Units (I.1).

Ample dormitory accommodation will be available on the campus. Alternatively, there are hotels adjoining or near the campus. The university is on a major subway, thus allowing easy access to the campus for participants who wish to stay in hotels in Boston. Two major free social events will be organized for all participants.

Commission & Committee News

The following are reports of some of the Commission and Committee meetings in Lyon. They are based on Summary Minutes submitted by the Secretaries. Further news of the Lyon Commission meetings will appear in subsequent issues of *CI*.

First pilot project for a Numerical Data Base on Conductance Data is ready

The situation of reports published and in press was examined by the Commission on Electrochemistry (I.3) when it met in Lyon. The book *Oxidation-Reduction Potentials in Aqueous Solutions — A Selective and Critical Source Book* (prepared jointly with Commission V.5) was published in August 1985. "Recommendations on Reporting Electrode Potentials in Non-aqueous Solvents", published in final form in *PAC* in 1984, was reprinted in *Electrochimica Acta* for wider dissemination. The revised camera-ready copy of "Interphases in Systems of Conducting Phases" was submitted in August 1985 for final publication. Furthermore, the final version of "The Absolute Electrode Potential. An Explanatory Note" was submitted to the Division for final approval.

Data Compilations on conductance data of electrolytic solutions and electrochemical kinetic parameters have been completed by the Commission. The most suitable type of dissemination was extensively discussed. The conductance data file in

a magnetic tape, containing over 3000 systems, will be released as a pilot project of a computerized data base for IUPAC. The compilation of electrochemical kinetic parameters will be published in book form.

The second draft of the document on "Semiconductor Electrochemistry" has been reviewed. The final form with a revised title "Terminology in Semiconductor Electrochemistry and Photoelectrochemical Energy Conversion" will be submitted to Commission I.1. The first drafts of "Electrode Potential in Non-aqueous Solutions", "Terminology for Microelectronic Ion-selective Devices in Electrochemistry", and "Recommendations for Reference Electrodes in Molten Salts" have been extensively reviewed. The revised documents will be circulated to the Commission as well as to external experts and will be discussed further during an off-year meeting planned in 1986. The report on "Interfacial Ion Transfer" will not be published in *PAC* as an IUPAC document. It was decided to postpone the implementation of the project on "Nomenclature for Non-isothermal Systems". A number of other issues were discussed, (1) Standard-state Pressure; (2) The Apparent Transfer Coefficient; (3) Liaison with ISO; (4) Revised and Condensed Version of the *Green Book*; (5) Relationship with the standing Commit-

From left: Profs K. Niki (Chairman), G. Fritzner (Secretary), S. Trasatti, R. Parsons and L. Faulkner.



tee on Chemical Data Bases, and (6) Potential Interest in Biotechnology and Biochemistry.

Proposals on "Real Surface Area Measurements in Electrochemistry" and "Redox Potentials of Biological Molecules" were discussed and approved as new projects.

The next meeting will be held in Lausanne, Switzerland, in September 1986.

S. Trasatti and K. Niki

Glossary of Terms in Photochemistry finalized

The Glossary of Terms in Photochemistry was discussed when Commission III.3 met in Lyon. The version considered included the suggestions of more than 100 scientists from 18 countries. The Glossary was also discussed with the Commission on Physical Organic Chemistry (III.2). The present version with about 400 terms will be submitted to the Division of Organic Chemistry for its consideration and publication.

Vice-President of Division to coordinate IUPAC sponsored symposia on macromolecules

At its meeting in Lyon, the Macromolecular Division Committee decided that, in view of the increasing number of macromolecular symposia, the Vice-President of the Division will, in future, advise on the recommendations for IUPAC sponsorship by the Division. Not only will he have to assess the quality of the proposed symposia or conferences — eventually, with the help of other members of the Division — but he will also be able to control the frequency of symposia on closely related topics. In doing so the Vice-President will need to take into account meetings organized outside IUPAC. National Representatives therefore will be requested to report to the Vice-President about symposia and conferences in the macromolecular field to be organized in their respective countries. This will have to be done at an early stage to make any coordination possible.

It was also decided, in the same perspective, that applications for IUPAC sponsorship through the Division should be made preferably 5 years in advance and certainly not later than 3 years before the date of the planned conference.

Following the increase in IUPAC interest in biotechnology, the Division will prepare a document listing the important input of the Division in this field. In particular the possibilities of combining natural and synthetic polymers or of modifying biopolymers, to achieve certain properties en-

The fourth draft on Fluorescence Standards was discussed and it is the purpose of the Commission to finalize it in 1987. Some of the compounds suggested as standards for the determination of fluorescence yields and lifetimes will be tested by several specialized laboratories around the world.

Several new projects were started:

Standardization on fluorescence decay data analysis

Standards for fluorescence polarization

Chemical actinometers

Methods and standards for the determination of molar absorption coefficients of transient species

The project on teaching photochemical concepts and experiments was continued and the collaboration of the photochemical community was solicited.

The next meeting will be held in Lisbon, Portugal, July 1986 on the occasion of the 11th IUPAC Sponsored Symposium on Photochemistry.

S. E. Braslavsky

abling practical applications, will be envisaged. This document will be discussed during the next informal meeting of the Division committee planned in June, 1986.

During the discussion on the financial situation of the Division all members concluded that the actual budget of the Division did not allow it to function reasonably and it certainly did not allow initiation of new activities. This Division has two Commissions only. The activities of these received an excellent rating by the Vice-President of the Union.

Commission IV.1 on nomenclature does not have a sufficient budget to allow its *Titular* members to attend a Commission meeting in the even years, except for special circumstances which cannot always be realized. A meeting in a non-General Assembly year is essential however for operating in a satisfactory way.

Commission IV.2 on "Polymer Characterization and Properties" proceeds through Working Parties with practically no financial support from IUPAC. The meeting in even years of the Working Parties' chairmen, who form the *Titular* membership of the Commission, is generally made possible by the participants from industry not claiming travel and subsistence expenses. Even so, Commission IV.2 seeks to expand its activities into areas considered of high importance although not yet explored

inside the Division.

This year Commission IV.2 and the Division approved a new Working Party on "Interactions of man-made polymers with living systems" for which additional financial support is needed. Commission IV.2 is also going to investigate the possibility of initiating in the near future two other Working Parties. One will be on "Computer modeling of free radical polymerization". This is to replace Working Party IV.2.5 on kinetic parameters for free radical polymerization. The other is in the important field of "Polymeric liquid crystals". At least one meeting of potential participants for each of the planned Working Parties will have to be convened. This will only be possible provided the budget of the Division is increased accordingly. The Division expects the Bureau to take the necessary steps to increase the allocations to the Division.

M. Mandel

New Organic Trace Analysis Working Group gets off to a good start

Draft reports on gas chromatographic detectors, including the mass spectrometer, h.p.l.c. detectors and problems in organochlorine trace analysis were presented and discussed at the Lyon meeting of the new Organic Trace Analysis Working Group. The Working Group is part of the Commission on Microchemical Techniques and Trace Analysis (V.2).

The Commission's other Working Group, on Surface Analysis, has been equally active in the area of standards and calibration methods for surface analysis of semi-conductors. It has covered the use of ion-implantation for standardization; nuclear analytical techniques for characterization of the superficial area of solids; calibration procedures for distribution of dopant elements in silicon and gallium arsenide and for thin dielectric films on silicon; and SIMS for distribution analysis through layers of changing matrix. The series of critical evaluations of analytical methods for trace elements continued with discussions of chromium, manganese and aluminium in biological materials and fluoride in various matrices. Future projects will involve vanadium in biological materials, and lead and cadmium in foods.

The Commission also considered reports on a wide variety of aspects of reference materials for trace analysis; decomposition methods in trace analysis; ion chromatography for anion determinations (jointly with Commission on Electroanalytical Chemistry V.5); and microscale preconcentration techniques for trace analysis. It was considered

that speciation might be the subject of future projects, and the necessity for involvement with biotechnology is to be excluded.

The next meeting of the Commission will be held in Antwerp, Belgium, 30 August, 1986 and that of the Organic Trace Analysis Working Group in Ondewater, Netherlands, 1 September 1986.

A. Townshend

New Analytical Chemistry Division Projects

The running division (intercommisisonal) projects were discussed at the Lyon meeting of the Analytical Chemistry Division (V) Committee. They will be completed during the next biennium (1985-87). The "water" project will result in three volumes to be published in 1986. The *Multilingual Dictionary* and the *Orange Book* will also be published in 1986. The project on Harmonization of Collaborative Studies will result in a conference to be held in Geneva in 1987. During the biennium 1985-87 the definition of a number of new division projects will be discussed in the Commissions and the Division Committee so that they can be precisely defined in Boston in 1987. These new projects will probably be on:

- Mathematical treatment of analytical data
- Atmospheric pollution
- Analytical chemistry in biotechnology

The next meeting of Analytical Chemistry Division Committee will be held during the Geneva Assembly in Boston, USA, 1987.

G. den Boef

Nomenclature for robotics

Nomenclature for robotics was one of three new projects proposed by the Commission on Automation and Clinical Chemical Techniques (VII.1) when it met in Lyon. The Commission met with members of the Clinical Chemistry Division Committee and reviewed the current and projected activities of the Commission. A number of new projects were proposed and progress on current documents discussed as follows:

1. Documents.
 - 1.1 Nomenclature for automated and mechanized analysis.
 - 1.2 Bioanalytical nomenclature.
 - 1.2.1 general terminology,
 - 1.2.2 classification of analysis,
 - 1.2.3 problems encountered with carry-over.
 - 1.3 Analytical applications of genetic engineering.
 - 1.4 Application of magnetic resonance for clinical analyses.

- 1.5 Nomenclature for electronic data processing.
- 1.6 Nomenclature for robotics.
- 1.7 Listing of recommendations for the development of software in new analysers.
- 1.8 Guidelines for preparation of laboratory procedure manual.
2. Acceptance and utilization of documents by industrial and professional organization.
3. Organization of the international congress of automation and new technology in the chemical laboratory.

Advice was sought from the Division Executive on where they felt the efforts of the Commission should best be directed in the light of the IUPAC Vice-President's biennial assessment of its work. Decisions on the future work of the Commission were a prominent feature of its meetings during the General Assembly.

All documents were reviewed and the revised drafts are to be forwarded through the Division Secretary to the Division for comment.

The three new projects are on nomenclature for robotics, genetically engineered probe reagents,

and functions of integrated instrument software. These were written up as proposals and presented to the Division for approval.

The Commission also met with the Commission on Analytical Nomenclature (V.3) on two occasions to consider existing and future joint projects. It was agreed that nomenclature for magnetic resonance, robotics and analytical applications of genetically engineered probe reagents be considered joint projects. Listing of recommendations for the development of software on new analyses would be considered by Commission V.3 as being part of the joint activities already established for electronics data processing.

The Commission held a joint meeting with the Commission on Teaching (VII.3) and it was agreed that the document guidelines for preparation of laboratory procedure manuals should be a joint effort. Both Commissions expressed a wish to extend the cooperation which already exists particularly with respect to the organization of joint symposia.

T. D. Geary

Commission VI.2 initiates a rebuilding programme emphasizing aspects of biotechnology related to applied chemistry

When the Commission on Biotechnology (VI.2) met in Lyon it agreed that aspects of biotechnology which comprise the uses of biological processes in applied chemistry should be of concern to the Commission. The principal tasks for the Commission thus include:

1. Compilation of interrelations, quantities, parameters and values of biotechnological and biological systems; development of a "glossary" of terms used in biotechnology.
Actions: sampling of data, scientific studies;
Aims: accessibility of reliable data of biological systems for research and application; unification of the "biotechnological language".
2. Assessment and adaptation of analytical and other chemical techniques for application in biotechnological processes.
Actions: elaboration, evaluation and recommendation of methods, in collaboration with other appropriate bodies within IUPAC;
Aims: availability of the most efficient methods for use in biotechnological processes.
3. Assessment of effects of local concentration of biological systems, as caused by biotechnological production or release of organisms into the environment for production purposes, for disposal, or unintentionally.

Actions: elaboration, evaluation and recommendation of methods;

Aims: recognition of influences on environment and technical systems.

4. Systemization of "type reactions" in biotechnology.

Actions: scientific studies;

Aims: availability of a principal scheme, simplification of application of biotechnological processes, augmentation of the organic synthesis chemistry.

5. Assessment of the applicability of new biotechnology products.

Actions: elaboration, evaluation and recommendation of methods;

Aims: safe application of products to be in contact with man or released into the environment.

6. Assessment of new sources of raw materials made possible by biotechnological developments.

Actions: elaboration of analyses and expertise;

Aims: elucidation of new opportunities for supply of raw materials.

7. Elaboration of an educational framework to enhance understanding of biotechnology in the chemical community.

Actions: development of a scheme of seminars and workshops in collaboration with appropriate IUPAC bodies;

Aims: dissemination of information and encouragement of interactions amongst disciplines.

These tasks will be shaped into specific projects in order or priority as listed.

The newly defined objectives of the Commission require new expertise and an expanded membership. Consequently, the Division President and Commission Chairmen are asking National Adhering Organizations to nominate appropriate candidates, and additionally are contacting selected individuals to explore their willingness to execute the programme outlined above.

Interunion Activities in Biotechnology

The Commission concurred with IUPAC about the interdisciplinarity of biotechnology and the necessity to participate actively in interunion collaborations. Furthermore, the Commission has defined its focus: the use of biotechnology in applied chemistry. The delineation of objectives of IUPAC Commission VI.2 (see above) will enable IUPAC to step into cooperations with other unions with a clarified contribution.

The Commission also supported fully the position articulated in the Report on Biotechnology from the General Secretary of IUPAC to the ICSU Executive Board (January 1985).

The Commission noted that the anticipated leading role to be played by IUPAC in biotechnology interunion activities must await the rebuilding of the Commission. This is planned to be completed by Spring 1986.

Ongoing Projects

Two projects (Hemicellulase and Organic Waste Materials) were approved and submitted for publication. Two further projects (Mycoinsecticides and Bacterial Insecticides) will be completed upon review by a recognized expert in environmental effects of microorganisms.

Representatives of the French Organizing Committee reported on progress in plans for the 8th IBS to be held in Paris, 1988. Both scientific content and financial arrangements were discussed. The Commission was satisfied with the status of preparations.

The next meeting of the Commission VI.2 will take place in Spring 1986 in a location to be announced.

G. G. Stewart

Toxicology Commission is restructured

The Commission on Toxicology (VII.4) is being restructured even though it has been given a rating of "excellent". Its work until now has been carried out by five sub-committees established for specific trace elements, namely nickel, cadmium, aluminium, selenium and chromium. However, it is impractical to continue with this structure because there are many more elements to cover and in fact, each expert member works with several or many different elements. The three largest sub-

committees, on nickel, cadmium and selenium, will be retained to complete existing projects, but several of their projects will be transferred to two new general sub-committees, one on analytical methods, the other on harmonization and quality assurance. These new sub-committees will apply themselves to the harmonization of analytical methods, including specimen handling, inter-laboratory comparison projects, and the establishment of reference and "field" methods, and refer-

The Commission on Toxicology (VII.4) in Lyon.



ence materials for all trace metals in biological specimens. A third new general sub-committee on risk assessment will also be established. Thus, the Commission will be able to make more efficient use of the funds and manpower which are available.

All the projects are related to clinical chemistry, which in many large hospitals includes toxicology. Another growing part of the work includes doing identification and quantification and the Commission wishes to bring these areas into its work. As a start a new project on the identification and analysis of *anabolic steroids* will be initiated by Profs. J. Savory and M. Mikač-Dević. Many members of the Division have carried out steroid analyses as routine tests. However, when a Sub-committee (or perhaps a Commission) on Drug Analysis, as applied to biological specimens, is established, other experts will be needed.

It is important to emphasize that clinical chemists are specialists in the handling and analysis of *biological specimens*, especially those from humans. For example, Prof. Tonks' laboratories analyse an average of 12 components in over 900 human specimens every day of the year. There is a big difference between the analysis of unstable serum or cerebrospinal fluid and the analysis of, say, a ton of solid steel.

Reports were presented at the Lyon meeting on all the Commission projects. Among these were two interlaboratory comparisons which were recently completed, one on wire cadmium and one on serum and wire selenium. Both of these will be published shortly. Control or reference specimens are being analysed for trace metals in whole blood, serum and wire. These will be extremely valuable. Reference and field methods for nickel, cadmium, aluminium and selenium are being developed. A draft paper entitled "Recommendation for Collection, Storage and Transport of Body Fluids for Nickel Analysis" by Dr Nieboer was received.

Details concerning several important conferences organized by members of the Commission were presented. The most recent one was a workshop on cadmium by Dr M. Stoeppler 26–28 August at Juelid, West Germany.

The next meeting of the Commission is planned to be held at the Ciba Foundation, London, UK in the Autumn, 1986.

D. B. Tonks

Water Chemistry Commission plans International Workshops

The Water Chemistry Commission (VI.6), which replaces the previous Commission on Water Quality, had its first meeting in Lyon. The new Commission decided that it should not duplicate work being done by other recognized international groups, although the Commission intended to establish effective liaison arrangements with such groups. These include the International Association on Water Pollution Research (IAWPRC), the International Organization for Standardization (ISO) and the World Health Organization (WHO) for example. Liaison arrangements have been made with other relevant IUPAC groups, for example the Harmonization Group and the Pesticide Commission.

The Water Chemistry Commission is anxious to use the international expertise available through IUPAC in deriving definitive statements in the field of water chemistry. In particular it would like to produce documents based on the application of sound scientific and engineering principles, and to publish standards and proposed regulations, relating to the water cycle. These should assist international and national regulatory bodies in the formulation of their policies and regulations.

A number of specific projects were identified as requiring priority treatment, although it was recog-



Water Chemistry Commission taken for a ride! Members of the Commission sample local water whilst taking some early morning exercise (Photo by W. Behrendt, courtesy UNESCO).

nized that only a limited number of these could be undertaken in the short-term.

The Commission will organize a closed workshop, in conjunction with a Commission meeting to be held in the Federal Republic of Germany during October 1986. The Workshop will be entitled "Removal of chlorinated hydrocarbons and heavy metals from waste waters by advanced treatment systems". A number of international experts will be invited to produce papers for discussion in the Workshop. It is intended that the papers, and a summary of the proceedings, will be published in the form of a book. The conclusions of the workshop will be used by the Commission to:

1. encourage further development and application of these techniques, and
2. note the implications of the best available technology when determining regulatory standards.

The Commission initiated a number of other projects and feasibility studies for detailed consideration at its next meeting. These include the comparison of treatability tests used in different countries; the application of "appropriate technology" solutions to water quality problems in developing countries; and the interaction of disinfectants with trace pollutants in potable water, to produce complex substances.

J. A. Tetlow

MY HUSBAND IS THAT VERY
SPECIAL AND WONDERFUL THING - ABROAD!



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Provisional Recommendations

IUPAC seeks your comments

In this section we publish synopses of IUPAC's latest provisional recommendations on nomenclature and symbols. All comments on these recommendations are welcome and will be taken into consideration. The final revised versions are published in *Pure and Applied Chemistry* and synopses of these published in *CI* as recent reports. If you would like to comment on the provisional recommendations please write to your nearest regional centre requesting a copy of the full report. Copies are not available from the Secretariat. The most up-to-date list of regional centres is shown below.

Terminology relating to crystalline polymers

These recommendations are concerned with the terminology relating to the process of crystallization and to two main types of crystal structure, that is, those comprising essentially rectilinear, parallel-packed chains, and those comprising so-called globular macromolecules. Since the latter are biological in nature, they are not covered in detail.

Furthermore, the document is limited to systems exhibiting crystallinity in the classical sense of three-dimensionally periodic regularity; accordingly, macromolecular systems with mesophases are omitted.

After a statement of basic definitions, the subject is subdivided into sections dealing separately with

structural and kinetic aspects. There are two structural sections; the first is directed to local structural arrangements, at the scale of a few bond lengths, and the second to those at the scale of the macromolecule as a whole and to assemblies of macromolecules.

Comments on these recommendations are welcome and should be sent before the end of September 1986 to Dr Norbert M. Bikales, Polymers Program, National Science Foundation, Washington, DC 20550, USA.

Addresses of National/Regional Centres

Argentina

Dr J. M. Barnett, Asociación Química Argentina, Sánchez de Bustamante 1749, Buenos Aires, Argentina.

Asia (Australia, Bangladesh, Hong Kong, Indonesia, Iraq, Korea, Malaysia, Nepal, Philippines, Singapore, Sri Lanka, Thailand)

Prof Huang Hsing Hua, Chemistry Department, National University of Singapore, Kent Ridge, Singapore 0511.

Canada

Prof. J. ApSimon, Department of Chemistry, Carleton University, Ottawa, Ontario K1S 5B6, Canada.

China

Prof Cui Meng-Yuan, Chinese Chemical Society, POB 2709, Beijing, China.
Prof F. C. Chen, Department of Chemistry, National Taiwan University, POB 30–373, Taipei 107, Taiwan.

Czechoslovakia

Dr Karel Bláha, Czechoslovak Chemical Society, Hradcanské nám. 12, 118 29 Prague 1, Czechoslovakia.

France

Prof Y. Jeannin, Comité National de la Chimie, 28 rue Saint-Dominique, F–75007 Paris, France.

FRG, Austria and Switzerland

Prof H. Grünewald, c/o Verlag Chemie GmbH, Postfach 1260/1280, Pappelallee 3, D–6940 Weinheim, Federal Republic of Germany.

Hungary

Prof E. Pungor, Altalános és Analitikai Kémiai Tanszék, Budapesti Műszaki Egyetem, Gellért tér 4, H-1521 Budapest XI, Hungary.

India

Mr A. K. Bose, Indian National Science Academy, Bahadur Shah Zafar Marg, New Delhi–110002, India.

Italy

Prof F. Rallo, c/o Società Chimica Italiana, 48 Via le Liegi, 1–00198 Roma, Italy.

Japan

Dr H. Hamada, Executive Director, Chemical Society of Japan, 1–5 Kanda Surugadai, Chiyoda-ku, Tokyo, 101 Japan.

Netherlands

Ir E. J. de Ryck van der Gracht, Koninklijke Nederlandse Chemische Vereniging, Postbus 90613, 2509 LP Den Haag, Netherlands.

Scandinavia

Dr K. Samuelsson, Tjänstedata, S–105 32, Stockholm, Sweden.

South Africa

Dr J. R. Bull, Organic Chemistry Division, National Chemical Research Laboratory, POB 395, Pretoria 0001, Republic of South Africa.

UK

Dr A. McNaught, Royal Society of Chemistry, Burlington House, Piccadilly, London W1V 0BN, UK.

USA

Dr Marianne Brogan, Journals Department, American Chemical Society, 2540 Olentangy River Road, POB 3330, Columbus, Ohio 43210, USA.

USSR

Prof G. B. Bokij, Commission on Nomenclature, National Committee of Soviet Chemists, Academy of Sciences of USSR, Kosygin Street 4, SU–117977 Moscow V–334, USSR.

If you are not within the jurisdiction of any of these centres, please write to: Dr K. L. Loening, Chemical Abstracts Service, POB 3012, Columbus, Ohio 43210, USA.

In this section we publish summaries of the most recent IUPAC Recommendations on Nomenclature and Symbols and Technical Reports. The full texts of these recommendations and reports are published in *PAC*.

An assessment of the melting, boiling, and critical point of the alkali metals

The measured melting, boiling and critical point data of the alkali metals are reviewed. Emphasis has been given to the assessment of the critical point data. The main experimental techniques for measurement in the critical region are described. The selected data are given. Best estimates of the critical constants of lithium are given.

This report was prepared by the Commission on High Temperature and Solid State Chemistry (II.3) and was published in PAC, Vol. 57, No. 10, pp. 1407–26 (1985).

Determination of triglycerides in fats and oils: results of a collaborative study and the standardized method

The development, by collaborative study, of a standardized method for the determination of the component triglycerides of animal and vegetable oils and fats is described. The procedure involves the separation of the triglycerides into groups containing the same number of carbon atoms, the separation being achieved by direct gas–liquid chromatography of solutions of the lipids on packed columns under temperature programmed conditions.

This report was prepared by the Commission on Oils, Fats and Derivatives (VI.3) and was published in PAC, Vol. 57, No. 10, pp. 1515–22, (1985).

Nomenclature for thermal analysis — IV

The recommendations update and supplement earlier versions of definitions in the field of thermal analysis. A new system of classification of thermal analytical techniques is outlined. A number of new techniques are defined and classified.

This report was prepared by the Commission on Analytical Nomenclature (V.3) and was published in PAC, Vol. 57, No. 11, pp. 1738–40 (1985).

Nomenclature, symbols, units and their usage in spectrochemical analysis — V: Radiation sources (Recommendations 1985)

Radiation sources are fundamental to the application of spectrochemical analytical methods and there has long been a need for uniformity in the description of these sources and their functions. This need has been underlined in recent years when several new types of sources have been developed and new words have been coined sometimes in conflict with other accepted terms. A difficulty which faced Commission V.4 was the way in which such radiation sources could be classified, i.e. by the type of radiation emitted, by their operation or by their application characteristics. Eventually, for practical purposes, the classification was made on the operating pressure and the type of radiation emitted. Preference was given to those sources used for analytical atomic spectroscopy which includes arcs, sparks, radiofrequency and microwave plasma, low-pressure electrical discharges in gases, and laser sources. This preference was made because other radiation sources (e.g. for X-ray, molecular spectroscopy, etc.) are dealt with or shall be dealt with, in other documents.

This report was prepared by the Commission on Spectrochemical and Other Optical Procedures for Analysis (V.4) and was published in PAC, Vol. 57, No. 10, pp. 1453–90, (1985).

Critical evaluation of model ecosystems

This report critically evaluates terrestrial, aquatic and mixed laboratory and outdoor model ecosystems with respect to their use and limitations in studying the fate of pesticides in the environment. Despite the difficulties of comparing the environmental relevance of the different models in use, an attempt has been made to appraise the reported systems in sequence from the point of view of effort involved and their prediction potential. The review concentrates on describing the concepts of the models, typical results which have been obtained and emphasizes reliability and prediction potential.

This report was prepared by the Commission on Pesticide Chemistry (VI.5) and was published in PAC, Vol. 57, No. 10, pp. 1523–36, (1985).

Source-based nomenclature for copolymers (Recommendations 1985)

A new report by the IUPAC Commission on Macromolecular Nomenclature offers nomenclature recommendations intended to provide a systematic source-based procedure for naming copolymers of several different types, including the major varieties of copolymers encountered in industry and in research. The recommendations are based on and are consistent with previous IUPAC *Basic definitions of terms relating to polymers*.

Copolymers are classified as unspecified, statistical, random, alternating, periodic, block, or graft, according to the characteristic sequence arrangement of the monomeric units within the polymer molecules, and a corresponding connective or prefix is included in the name to specify this aspect of structure. The component monomer names can be in the trivial, semi-systematic, or systematic form. Provision is made for the naming of terminal units and of connecting units between segments. It is also possible to express molar masses or degrees of polymerization of segments, as well as mass fractions or mole fractions of monomeric units, by means of a short addendum to the name.

The document contains two closely-related alternative versions of the system, differing in detail, each of which has advantages in particular situations.

This report was prepared by the Commission on Macromolecular Nomenclature (IV.1) and was published in PAC, Vol. 57, No. 10, pp. 1427–40, (1985).

A collaborative study of the rheological properties and unstable melt spinning characteristics of linear and branched polyethylene terephthalates

A comparative study by several industrial and academic laboratories of the rheological properties and melt spinning behaviour of a series of molecularly characterized linear and a branched polyethylene terephthalates is reported. Steady shear viscosity, normal stresses, dynamic sinusoidal behaviour, and capillary entrance elongational flow behaviour are reported. The branched melt has a lower shear and dynamic viscosity (at the same molecular weight), a higher steady state compliance and principal normal stress difference (at the same shear stress). The elongational viscosity of the branched sample seems to be increasing with tensile stress. The branched sample exhibits

From provisional recommendations to recent report

In the previous issue of *CI* we published a flow sheet showing the revised procedure for comment on and approval of IUPAC recommendations on nomenclature and symbols. The first report to have passed through the whole revised procedure is the report on "Source-based Nomenclature for Copolymers". A synopsis of this report was published as Provisional Recommendations in *CI*, Vol. 6, No. 3, p. 13 (1984). These Provisional Recommendations were sent to 18 regional centres for distribution to interested chemists. Comments on the recommendations received before February 1985 were taken into consideration when preparing the final version of the report. This was published in the October 1985 issue of *Pure and Applied Chemistry (PAC)*, Vol. 57, No. 10, pp. 1428–1440). A synopsis of the recommendation is now published as a "Recent Report" on this page.

much greater spinline stability than the linear polyester. The results of different laboratories are compared.

This report was prepared by the Commission on Polymer Characterization and Properties (IV.2) and was published in PAC, Vol. 57, No. 10, pp. 1441–52, (1985).

Determination of mercury in foodstuffs

The recently published (*PAC*, Vol. 57, pp. 1507–1514, 1985) reference method for the determination of small amounts of mercury in foodstuffs and biological materials is an extension and revision of a similar method published in 1979 (*PAC*, Vol. 51, pp. 2527–2536, 1985).

The method consists of wet combustion using a mixture of nitric and sulphuric acids, in a special all glass apparatus (Thiele-Pape) designed to prevent any loss of mercury by volatilization (an alternative simple method of digestion for fish samples is also described). The limit of determination is 0.01 mg kg⁻¹ (for amounts below this a concentration step using permanganate can be used). The mercury is determined in the digest, after dilution with water and removing the excess oxidizing substances with hydroxylamine, by reducing the mercury(II) to

metallic mercury with tin(II). The mercury is then evolved by a stream of nitrogen at room temperature and measured by cold vapour atomic absorption at 253.7 nm. Control of non-atomic absorption and molecular effects, when digestion is incomplete, is carried out by making an amalgam with palladium on glass wool which effectively removes the absorption peak due to mercury. As in all trace analysis, stringent precautions have to be taken to prevent contamination. The method has been subjected to a collaborative study by some members of the IUPAC Commission on Food Chemistry.

This report was prepared by the Commission on Food Chemistry (VI.1) and was published in PAC, Vol. 57, No. 10, pp. 1507–14, (1985).

Recommended terms, symbols, and definitions for electroanalytical chemistry (Recommendations 1985)

This Report lists 82 terms and symbols pertaining to electroanalytical chemistry, includes recommendations concerning their retention or use, and gives a definition of each one whose use is recommended.

This report was prepared by the Commission on Electroanalytical Chemistry (V.5) and was published in PAC, Vol. 57, No. 10, pp. 1491–1505, (1985).

Conferences

Togo hosts international conference

The Third International Chemistry Conference in Africa will be held in Lomé, Togo from 30 June to 4 July 1986. The conference is the third in a series of triennial conferences initiated in 1980. They aim to bring together chemists, chemistry teachers and chemical engineers from African countries to exchange ideas about chemical research and teaching. This conference is sponsored by the Chemistry Department at the University of Benin, Lomé and The Association of Faculties of Science of African Universities (AFSAU).

The theme of the Third Conference is Natural Renewable Resources. There will be plenary lectures and technical presentations in the following areas:

Chemistry and energy production,
Chemistry and health services delivery,
Chemistry and food production,
Chemistry and water sources and resources,
Chemistry and environmental management,
Chemistry sciences technology,
Chemistry education.

The plenary lectures will be given in either French or English. Simultaneous translation will be provided.

For further information contact, The Secretary, 3rd I.C.C.A., Department de Chimie, Ecole des Sciences, University du Benin, B. P. 1515, LOME, Togo.

IUPAC-Sponsored Conferences

24th International Conference on Coordination Chemistry *Athens, Greece, 24–29 August 1986*

This conference is sponsored by IUPAC, the Greek Ministries of Culture and Sciences, Research and Technology, and the Nuclear Research Center "Demokritos". It is organized by the University of Athens and the Association of Greek Chemists. The Conferences sessions will be held in the Campus of the University. The Conference will focus on recent developments of coordination chemistry in the

following general areas:

- A. Structure and bonding,
- B. Reaction mechanisms,
- C. Coordination compounds in catalysis,
- D. Bioinorganic chemistry,
- E. Techniques and applications of coordination chemistry.

The plenary lecturers will be Prof. Yuri A. Buslaev (USSR), Prof. Jack Halpern (USA), Prof. James P. Collman (USA), Prof. André E. Merbach (Switzerland) and Prof. D. Michael P. Mingos (UK).

Abstracts of the scientific contributions will be published in a special issue of *Chimica Chronica, New Series*, the scientific journal of the Association of Greek Chemists. They will be distributed during registration. Plenary lectures will be published in *PAC*.

The official language of the conference will be English, but posters may be presented in any other language. Registration fees for participants are US-\$150.00 if received by April 30, 1986 and US-\$170.00 if received after this date.

A rich programme of social events and tours is planned. This will include a conference reception, a one-day cruise, city tour, half-day tour to Cape Sounion and the conference banquet. Other single and multi-day tours before, during and after the conference will be available.

Next Congress to be held in Sofia

The 31st IUPAC Congress will be held on 13–18 July 1987 in Sofia at the National Palace of Culture. The Bulgarian Academy of Sciences will be responsible for the organization of the Congress. The Scientific Programme will include nine sections:

Analytical chemistry;
Education;
Engineering chemistry;
Industrial chemistry;
Inorganic chemistry;
Organic chemistry;
Physical chemistry;
Polymers;
Clinical chemistry.

CHEMRAWN IV postponed

CHEMRAWN IV has been postponed once again. The conference which was to have been held 24–29 March 1986 in Woods Hole, Massachusetts, USA will now be held in 1987. Further details will appear in forthcoming issues of *CI*.

6th International Conference on Organic Synthesis

Moscow, 10–15 August 1986

This Conference is sponsored by IUPAC and the D. I. Mendeleev All-Union Chemical Society and organized by the Academy of Sciences of the USSR.

The scientific programme will include 10 plenary lectures, 20 review lectures, and a poster session on the following four main topics:

1. Modern Methodology in Organic Synthesis,
2. Regio- and Stereoselective Reactions in Organic Synthesis,
3. Elementoorganic Reagents in Organic Synthesis,
4. Homolytic and One-Electron Transfer Reactions in Organic Synthesis.

The languages used in the Conference will be English and Russian. Simultaneous translation will be provided for the opening and closing ceremonies.

There is also a social programme, both for the participants and their guests. This includes sight-seeing of Moscow, visits to museums, concerts and river trips. The social events offered by the Organizing Committee are free of charge.

Conference Calendar

Conference circulars and registration forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in brackets.

1986

Biological Reference Materials

24–25 April. 2nd International Symposium on Biological Reference Materials. Neuherberg, Munich, FRG.
(Dr M. Stoeppler, Institut für Chemie der Kernforschungsanlage, Jülich GmbH, Institut 4: Angewandte Physikalische Chemie, Postfach 1913, D-5170 Jülich 1, Federal Republic of Germany.)

Organic Chemistry in Technological Perspective

1–6 June. International Symposium on Organic Chemistry of Technological Processes. Jerusalem, Israel.
(Symposium Secretariat, 1st International Symposium on Organic Chemistry in Technological Perspective, PO Box 50006, Tel-Aviv 61500, Israel.)

Human Toxicity

19–22 May. International Symposium on Biochemical and Cellular Indices of Human Toxicity in Occupational and Environmental Medicine. Milan, Italy.
(International Symposium, Biochemical and Cellular Indices of Human Toxicity in Occupational and Environmental Medicine, AISC-Organizing Secretariat, Viale Parioli 2, 00197 Roma, Italy.)

Ring-Opening Polymerization

22–26 *June*. 5th International Symposium on Ring-Opening Polymerization. Blois, France. (ROP 86 Secretariat, Laboratoire de Chimie Macromoléculaire, Université Pierre et Marie Curie, LA 24 Tour 44 — 1er étage, 4 Place Jussieu, 75230 Paris Cédex 05, France.)

Synthetic Polymeric Membranes

7–10 *July*. 29th Microsymposium on Macromolecules. Prague, Czechoslovakia. (Mrs H. Konášová, Secretary, P.M.M. Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 1888 Petriny, CS-162 06 Prague 616, Czechoslovakia.)

Crosslinked Epoxides

14–17 *July*. 9th Discussion Conference on Macromolecules. Prague, Czechoslovakia. (Mrs H. Konášová, Secretary, P.M.M. Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 1888 Petriny, CS-162 06 Prague 616, Czechoslovakia.)

Chemical Thermodynamics

14–18 *July*. International Conference on Chemical Thermodynamics. Lisbon, Portugal. (Dr J. A. Martinho Simoes, Complexo 1, Instituto Superior Tecnico, Av. Rovisco Pais, 1096 Lisboa Codex, Portugal.)

Analytical Chemistry

20–26 *July*. SAC 86: International Conference on Analytical Chemistry. Bristol, UK. (The Secretary, Analytical Division, Royal Society of Chemistry, Burlington House, London W1V 0BN, UK.)

Chemical Toxicology and Clinical Chemistry of Metals

27–31 *July*. International Conference on Bio- and Toxicokinetics of Metals (III COMTEX). Kitakyushu, Japan. (Prof. Yasushi Kodama, School of Medicine, University of Occupational and Environmental Health, 1-1 Iseigaoko, Yahata Nishi Ku, Kitakyushu, Japan.)

Photochemistry

27 *July*–1 *August*. 11th International Symposium on Photochemistry. Lisbon, Portugal. (Prof. Dr Sílvia M. B. Costa, Centro de Química Estrutural, Complexo 1, Instituto Superior Técnico, Av. Rovisco Pais, 1096 Lisboa Codex, Portugal.)

Organic Synthesis

10–15 *August*. 6th International Conference on Organic Synthesis. Moscow, USSR. (Dr G. V. Kondratieva, Institute of Organic Chemistry, Leninsky Prospect 47, SU-117913 Moscow B-334, USSR.)

Pesticide Chemistry

10–15 *August*. 6th International Pesticide Chemistry Congress. Ottawa, Canada. (The Chemical Institute of Canada, 151 Slater Street, Suite 906, Ottawa, Ontario, Canada K1P 5H3.)

Carbohydrates

10–16 *August*. 13th International Carbohydrate Symposium. Cornell University, Ithaca, New York, USA. (Prof. James N. BeMiller, Department of Chemistry and Biochemistry, Southern Illinois University at Carbondale, Carbondale, Illinois 62901, USA.)

Solubility Phenomena

12–15 *August*. 2nd International Symposium on Solubility Phenomena. Newark, New Jersey, USA. (Dr M. Salomon, Symposium Co-Chairman, PO Box 254, Fair Haven, New Jersey 07701, USA.)

Non-aqueous Solutions

17–21 *August*. 10th International Conference on Non-aqueous Solutions. Leuven, Belgium. (Dr G. Maes, Department of Chemistry, University of Leuven, Celestijnenlaan 200F, B-3030 Heverlee, Belgium.)

Zeolite Chemistry

17–22 *August*. 7th International Conference. Tokyo, Japan. (Prof. Hiro-o Tominaga (7 IZC), Department of Synthetic Chemistry, Faculty of Engineering, The University of Tokyo, Hongo, Bunkyo-ku, Tokyo 113, Japan.)

Natural Products

17–22 *August*. 15th International Symposium on the Chemistry of Natural Products. The Hague, Netherlands. (Dr G. J. Koomen, Secretary, 15th IUPAC International Symposium on the Chemistry of Natural Products, Laboratorium voor Organische Scheikunde, Universiteit van Amsterdam, Nieuwe Achtergracht 129, 1018 WS Amsterdam, Netherlands.)

Physical Organic Chemistry

24–29 *August*. 8th IUPAC Conference on Physical Organic Chemistry. Tokyo, Japan. (VIIth ICPOC, The Chemical Society of Japan, 1–5 Kanda-Surugadai, Chiyoda-ku, Tokyo 101, Japan.)

Coordination Chemistry

24–29 *August*. 24th International Conference on Coordination Chemistry. Athens, Greece. (Dr Ersi Vrachnou-Astra, Department of Chemistry, Nuclear Research Center 'Demokritos', 153 10 Aghia Paraskevi, Athens, Greece.)

Raman Spectroscopy

31 August–5 September. 10th International Conference on Raman Spectroscopy. Eugene, Oregon, USA.
(Bruce Hudson, ICORS-X, Chemical Physics Institute, University of Oregon, Eugene, OR 97403, USA.)

Phosphorus Chemistry

31 August–6 September. International Symposium on Phosphorus Chemistry. Bonn, FRG.
(Prof. Dr R. Appel, Anorganisch-Chemisches Institut der Universität Bonn, Gerhard-Domagk-Str. 1, D-5300 Bonn 1, Federal Republic of Germany.)

CHEMRAWN V

22–26 September. CHEMRAWN V: Current and Future Contributions of Chemistry to Health — The New Frontiers. Heidelberg, FRG.
(Dr W. Fritsche, General Secretary, Gesellschaft Deutscher Chemiker, Varrentrappstrasse 40–42, D-6000 Frankfurt/Main 90, Federal Republic of Germany.)

Natural Toxicants. Mutagenicity of Food

15–17 October. Interdisciplinary Conference (EURO FOOD TOX II). Zürich, Switzerland.
(Dr R. Battaglia, Kent Laboratory, Postfach, CH-8030 Zürich, Switzerland.)

Environmental Characterization

10–12 November. International Symposium on New Sensors and Methods for Environmental Characterization. Kyoto, Japan.
(International Symposium SMEC, c/o Institute for Chemical Research, Kyoto University, Uji, Kyoto 611, Japan.)

1987

CHEMRAWN VI

17–22 May. CHEMRAWN VI: World Conference on Advanced Materials Needed for Innovations — Energy, Transportation and Communications. Tokyo, Japan.
(CHEMRAWN VI Coordinating Office, The Chemical Society of Japan, 1–5 Kanda-Surugadai, Chiyoda-ku, Tokyo 101, Japan.)

Macromolecules

30 June–4 July. 31st International Symposium on Macromolecules. Merseburg, GDR.
(Technische Hochschule “Carl Schorlemmer”, Leuna-Merseburg, German Democratic Republic.)

Macromolecules

6–9 July. 30th Symposium on Macromolecules. Polymer-Supported Organic Reagents and Catalysts. Prague, Czechoslovakia.
(Dr P. Cefelin, Scientific Secretary, P.M.M. Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovského namesti 2, CS-16206 Prague 6-Petriny, Czechoslovakia.)

IUPAC Congress

13–18 July. 31st International Congress of Pure and Applied Chemistry. Sofia, Bulgaria.
(Dr R. Vlahov, Institute of Organic Chemistry, Bulgarian Academy of Sciences, 1113 Sofia, Bulgaria.)

Heteroatom Chemistry

19–24 July. International Conference on Heteroatom Chemistry (ICHAC-1987). Ibaraki, Japan.
(Prof. Shigeru Oae, Department of Chemistry, Okayama University of Science, Ridai-cho, Okeyama 700, Japan.)

Coordination Chemistry

26–31 July. 25th International Conference on Coordination Chemistry. Nanjing, China.
(Prof. Guang-Xian Xu, Director of Inorganic Chemistry Division, Department of Chemistry, Peking University, Beijing, China.)

Trace Elements

17–21 August. 2nd Nordic Symposium on Trace Elements in Human Health and Disease. Odense, Denmark.
(Prof. Philippe Grandjean, Department of Environmental Medicine, Institute of Community Health, Odense University, J. B. Winslows Vej 19, DK-5000 Odense C, Denmark.)

Fourier Transform Spectroscopy

24–28 August. 6th International Conference on Fourier Transform Spectroscopy. Vienna, Austria.
(Prof. R. Kellner, Institute for Analytical Chemistry, Technical University Vienna, Getreidemarkt 9, A-1060 Wien, Austria.)

1988

Natural Products

29 May–4 June. 16th International Symposium on the Chemistry of Natural Products. Kyoto, Japan.
(Prof. Sho Ito, Department of Chemistry, Faculty of Science, Tohoku University, Aramaki-aza-Aoba, Sendai 980, Japan.)

Macromolecules

1–6 August. 32nd International Symposium on Macromolecules. Kyoto, Japan.
(Prof. Takeo Saegusa, Department of Synthetic Chemistry, Faculty of Engineering, Kyoto University, Yoshida-machi, Sakyo-ku, Kyoto 606, Japan.)



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The Journal of Chemical Thermodynamics EDITORS

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The Journal of Chemical Thermodynamics publishes papers reporting the results of significant measurements of thermochemical and equilibrium quantities for chemical reactions and of thermodynamic properties of pure substances and of mixtures, by calorimetric, pVT, spectroscopic, and other methods.

The Editors and Advisory Board of the journal were appointed by a task group established by members of the Commission of Thermodynamics of the International Union of Pure and Applied Chemistry.

Recent Contents

Enthalpies of formation of first-row transition-metal diborides by a new calorimetric method, **L. Tópor and O.J. Kleppa**. Isothermal (vapour + liquid) equilibria of propan-1-ol + acetonitrile and + trichloromethane and of (propan-1-ol + acetonitrile + trichloromethane), **I. Nagata**. Thermodynamic studies on the successive phase transitions in LiKSO_4 crystals at low temperatures, **L. Abello, K. Chhor and C. Pommier**. Thermodynamics of uranium intermetallic compounds. I. Heat capacities of URu_3 and URh_3 from 5 to 850 K, **E.H.P. Cordfunke, R.P. Muis, G. Wijbenga, R. Burriel, M. (W.K.) To, H. Zainel and E.F. Westrum Jr.** Vapour pressure and excess Gibbs energies of (2-methyl-pyridine + methylbenzene), (2,4-dimethylpyridine + 1,2-dimethylbenzene), and (2,6-dimethylpyridine + 1,2- or 1,3- or 1,4-dimethylbenzene or ethylbenzene) at $T = 373.15$ K. **M. Rogalski**. Vapour pressures and excess Gibbs energies of (2,4,6-trimethylpyridine + 1,2,4- or 1,3,5-trimethylbenzene or *n*-propylbenzene or isopropylbenzene or *n*-butylbenzene or isobutylbenzene) at $T = 373.15$ K, **M. Rogalski**. Ultrasonic speeds and thermodynamics for (toluene + *o*-xylene) and (toluene + aniline) under high pressures, **T. Takagi and H. Teranishi**. Enthalpy of solution of KCl in water at 308.15 and 313.15 K, **A. Sanahuja**. H_m^E and V_m^E for (2,2-dimethylbutane or 2-chloro-2-methylpropane + a monoalcohol), **P. Perez, M. Gracia and C. Losa Gutiérrez**. Excess molar volumes of (*N*-formylmorpholine + a glycol) at 298.15, 308.15, and 318.15 K, **A.M. Awwad, S.F. Al-Madafi, K.A. Jbara and T.W. Alchy**. The thermodynamic properties of six compounds in (tellurium + oxygen + hydrogen) from 10 to 1000 K, **E.H.P. Cordfunke, R. Cluistra and J.C. van Miltenburg**. Thermochemical properties of benzoic acid derivatives.

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The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary, non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.

Its objectives are:

- to promote continuing co-operation among the chemists of the member countries;
- to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
- to co-operate with other international organizations which deal with topics of a chemical nature;
- to contribute to the advancement of pure and applied chemistry in all its aspects.

The membership of IUPAC presently comprises 42 countries, each represented by a national organization, such as an academy of science or research council.

NATIONAL ADHERING ORGANIZATIONS

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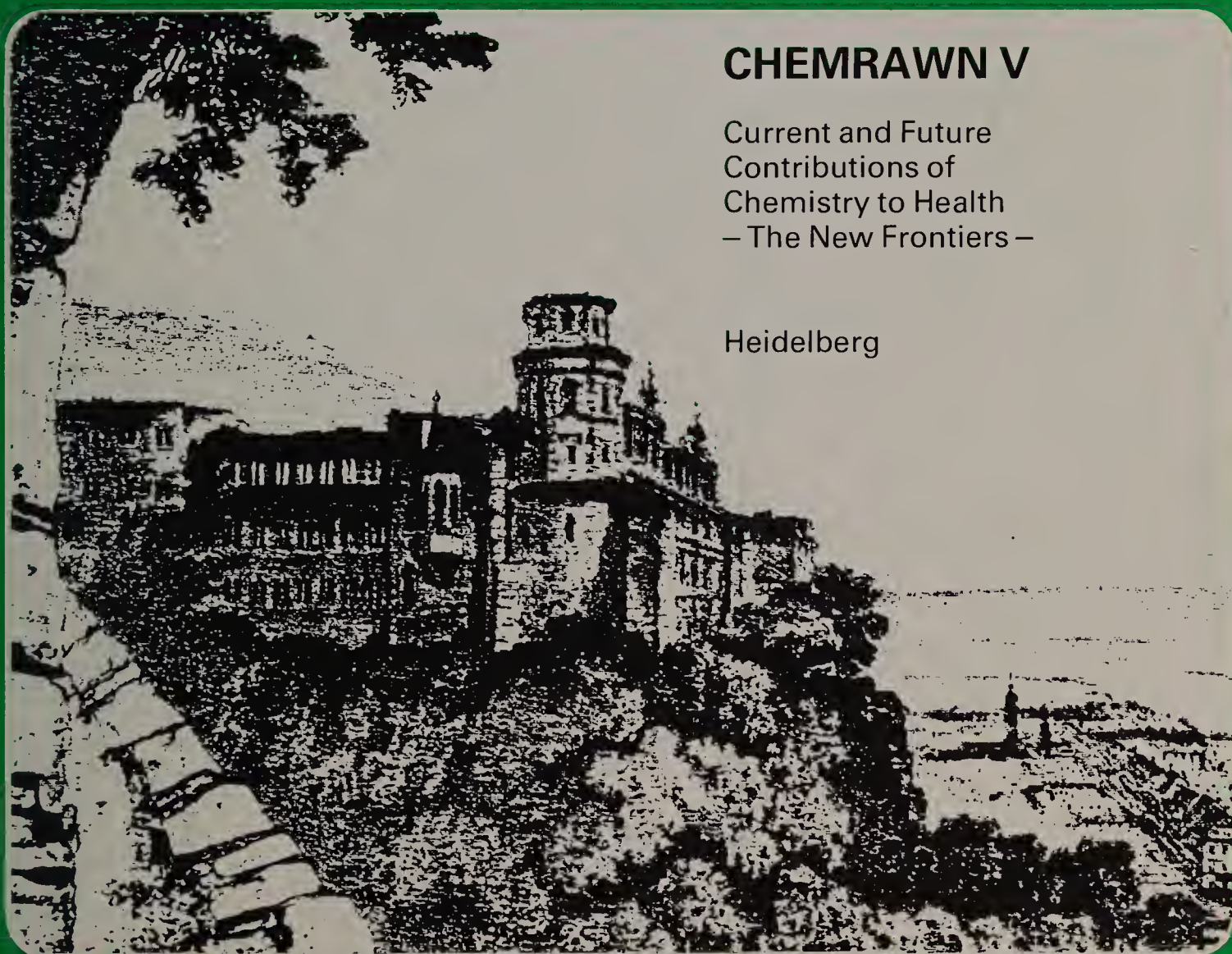


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Chemistry International

The news magazine of the International Union
of Pure and Applied Chemistry (IUPAC)



CHEMRAWN V

Current and Future
Contributions of
Chemistry to Health
– The New Frontiers –

Heidelberg



IUPAC

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The news magazine is delivered to North America by accelerated surface post and subscribers there can expect to receive their copies within two weeks of British publication. Current issues for the Indian Sub-Continent, Australasia and the Far East are sent by air to regional distribution points from where they are forwarded to subscribers by surface mail. Any back numbers are normally despatched by surface to all regions, except North America where they are sent by a.s.p., and India, where they are sent by air freight.

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Reproduction or translation of articles in this issue is encouraged, provided that it is accompanied by a reference to the original publication in *Chemistry International*, unless there is a footnote to the contrary.

Front cover: View of Heidelberg, venue of CHEMRAWN V, 22–26 September 1986.

IUPAC's role in chemical safety

At the IUPAC General Assembly held in Lyon, France, 29 August–7 September 1985, Council approved a joint CHEMRAWN/COCI proposal that "IUPAC assumes under its charter the responsibility to address matters of chemical safety in their broadest aspects and in a continuing way" and that "Dr William G. Schneider, Past President of IUPAC, be appointed to head the study team to identify goals, objectives and proposed initial activities for this new IUPAC initiative" (see *CI*, No. 6, p. 13, 1985).

As a first step, Dr Schneider convened a meeting of the study team. The meeting was held at the Goring Hotel, London SW1, UK, and was attended by Dr Alan Hayes (UK), Member of the CHEMRAWN Committee; Dr Bryant Rossiter (USA), Chairman of the CHEMRAWN Committee and Dr William Schneider (CANADA), Past-President of IUPAC. Dr S. Varadarajan (India), Member of the CHEMRAWN Committee, was invited but unable to attend.



Dr Hayes (left), Dr Schneider (centre) and Dr Rossiter (right) discussing IUPAC's role in chemical safety.

The study team proposed that IUPAC, in co-operation with a number of relevant national and international organizations, should sponsor a Conference on Chemical Safety based on the CHEMRAWN format. The team planned a further meeting for Spring 1986. The aim of this meeting would be to identify objectives for the Conference.

Officers budget allocation meeting

When the Officers met at the IUPAC Secretariat in Oxford, 26–27 November 1985, they were faced with requests from IUPAC bodies for the next biennium (excluding the Boston General Assem-



The Officers, meeting at the Secretariat in Oxford, face requests from IUPAC bodies totalling nearly US-\$413 000.

bly) totalling nearly US-\$413 000. The aim of the meeting, which was attended by Profs. Rao (President), West (Secretary General) and Björkman (Treasurer), was to allocate budget monies for 1986/7. However, earlier in 1985, the Council at Lyon did not approve a rise in national subscriptions for the biennium and allowed a total of US-\$300 000 for current (A) and priority (B) programmes. The Officers felt that the scientific activities of the Union (the work of the Divisions and Commissions) should receive financial priority over the administrative bodies (most of the Standing Committees). In view of this they reconsidered a planned meeting of the Executive Committee to be held in New Delhi, India, 10–11 March this year. The Officers reluctantly decided not to call a full meeting of the Executive Committee at this time. Instead, they planned a meeting of the IUPAC Officers only in New Delhi, to expedite the business of the Union. It was judged to be more important to maintain the full Bureau Meeting in mid-1986 and to hold a full Executive Committee Meeting in the Spring of 1987 — a few months before the Boston General Assembly.

Affiliate scheme grows

Three more countries have agreed to implement the Affiliate Membership Scheme. This brings the total to 35 countries. The three countries to be added to the list published in *CI*, No. 1, p. 2 (1986) are:

Bulgaria
Ireland
Singapore

National Committees

Canada. Dr J. E. Guillet was elected Chairman of the Canadian National Committee at its meeting in Montreal on 24 November 1985. He succeeds Dr Renzoni who completed his term on 31 December 1985.

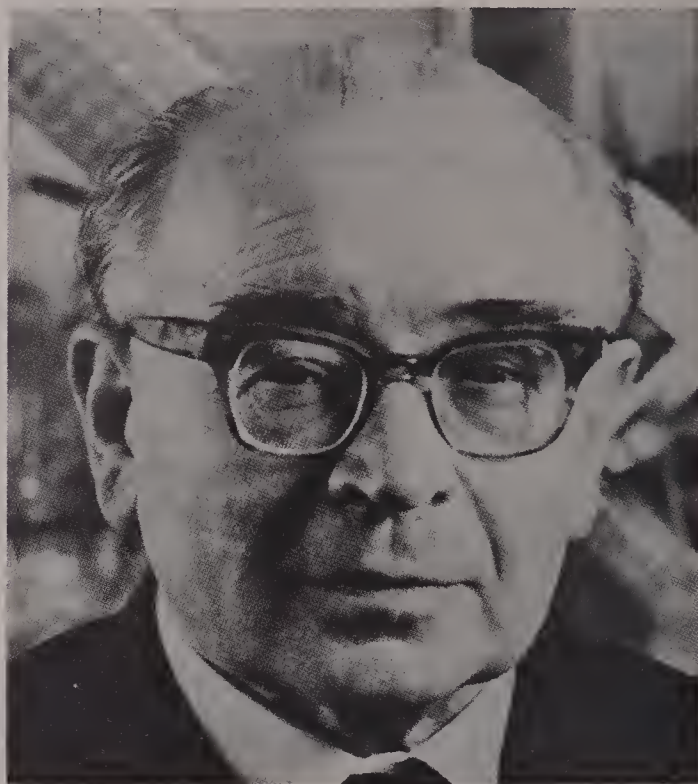
India. The Indian National Science Academy has reconstituted the Indian National Committee. The Chairman of the Committee is now Dr Sukh Dev, Director of the Malti Chem Research Centre and its Secretary is Dr V. Krishnan of the Indian Institute of Science, Bangalore.

Japan. Prof. Saburo Nagakura, President of IUPAC 1981–83, and Member of the Executive Committee 1979–85 has been appointed Chairman of the National Committee for Chemistry (NCC), Science Council of Japan. This follows the resignation last November of Prof. S. Shibata as Chairman. Prof. Shibata served as Chairman of the NCC of Japan from 1975 after retiring from the IUPAC Bureau where he served for 8 years.

We regret to record the death of:

Prof. E. Cherbuliez, Switzerland (28 October 1985) — Biological Chemistry Section Committee (1956–59), Commission on Nomenclature of Biological Chemistry (1951–59).

Prof. W. Kemula, Poland (17 October 1985) — President of Analytical Chemistry Division (1969–73), Commission on Electroanalytical Chemistry (1957–79), Commission on Microchemical Techniques and Trace Analysis (1979–85), Coordinating Committee on Analytical Methods for CEE and IARC (1969–73), Affiliated Committee on Tables of Constants.



Prof. W. Kemula.

Letter to the Editor

Biotechnology

Sir,

I would like to thank Dr Campbell (see "Letter", *CI*, 1986, No. 1, p. 3) for his interest in my article "Biotechnology (not only 'Bio' but also 'Technology')" (*CI*, No. 5, pp. 19–22, 1985), for his interest in the work of our Commission on Biotechnology, and above all for his remark: "IUB stands ready to receive suggestions". To begin with, I would like to emphasize that the article was not identical with the programme of the Commission on Biotechnology. It presented a personal scientific point of view on the development of biotechnology. My intention was to write about the situation in the field of technology and not about biotechnology as a whole.

It seems obvious to me that the thesis: "Biotechnology is not only Bio but also Technology" gives rise to the opposite thesis:

"Biotechnology is not only Technology but also Bio". Nobody, myself included, has any doubts that the working principles underlying biotechnological processes are biological ones. So "Bio" is important anyway and may be even of priority. But, nevertheless, it appears to me that the technological aspect of biotechnology is not developing adequately compared to the biological one. It is evident that there is a bias in the scientific literature on the side of "Bio". This could be one of the reasons why novel commercial products are not developing as quickly as we would like.

There is a more fundamental question, however, which should not be overlooked. In the development of the productive forces of mankind the only successful methods of production are those which turn out to be more economical than the most advanced in use. These include methods of producing new products with new applications for man as well as new processes which are more efficient in



Prof. Ringpfeil in Lyon.

the production of products already in use. Deeper insights into the laws of technology may thus help to bring forward the application of biotechnology once the life sciences have elucidated the pathways of syntheses, the structures of products, and so on.

Now some remarks about the work of the Commission on Biotechnology. In the State of the Union Report at the Lyon General Assembly the President stated that "a stronger and more visible programme and expertise in Biotechnology within its present Commission . . . have been initiated". Indeed, during its meetings at Lyon, the Commission accepted a programme suited to the intentions and duties of IUPAC in the field of Biotechnology. We are now developing projects within that framework. The principal tasks on which these projects are based were elaborated in a report published in the February issue of *CI* (see *CI*, No. 1, pp. 41–42, 1986).

If these projects are to be successful we need the active support of scientists from different disciplines. Dr Campbell's letter and my article have opened up an avenue for seeking the support of the IUPAC community and related communities. May I therefore ask readers of *CI* to support our efforts. Please write to us and let us know how you would like to contribute to our programme.

Prof. M. Ringpfeil

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Who's who in IUPAC

In this, the second of our series on who's who in IUPAC we publish a pen-portrait of Prof. Kazuo Saito who succeeded Dr Mary Good as President of the Inorganic Chemistry Division in September 1985.

Kazuo Saito became Professor of Coordination Chemistry at Tohoku University, Sendai, Japan in October 1963. This was a new chair. His research interests centred on stereochemistry of metal complexes and reaction kinetics of ligand substitution and electron transfer reactions of coordination compounds, with special reference to reactivity of various metallic elements, reaction mechanisms and regio and stereoselectivity of these reactions.

In May 1984, Prof. Saito moved to the new Coordination Chemistry Laboratories affiliated to the "Institute for Molecular Science", an Inter-University Research Institute in Okazaki, Japan. His work was concerned with the interdisciplinary region between molecular science and coordination chemistry in solution and in the solid state.

Kazuo Saito was born in Tokyo, Japan on 26 July 1923. He studied in Tokyo and graduated from "Tokyo Imperial University" (renamed University of Tokyo) in 1945. After postgraduate studies he



worked as a Research Assistant in the University of Tokyo and received his Doctor's Degree in 1952. From 1953 to 1955 he was a Ramsay Memorial Postdoctoral Fellow in the Chemistry Department, University of London, UK. He worked with Profs. H. Terrey and R. S. Nyholm on the complex formation between polyaminocarboxylates and Group III elements. In 1956, Prof. Saito became Associate Professor at the Institute for Nuclear Studies, University of Tokyo. He studied the preparation of radioisotopes in various chemical forms and reaction kinetics of isotopic exchange reactions involving coordination compounds of metallic elements.

Prof. Saito has been involved in scientific education as Chairman of the Natural Science Division, Committee for the Authorization of Teaching Materials, Ministry of Education. As a Member of the Selection Committee of the Japan Society for

Promotion of Sciences he has also been active in promoting the international exchange of scientists. He is a member of various committees of the Chemical Society of Japan, and regional advisory editor of the *Analyst*, *Journal of Crystallographic and Spectroscopic Research* and other journals.

Prof. Saito first became active in IUPAC in 1975 when he became National Representative for the Commission of Nomenclature of Inorganic Chemistry (1975–79). From 1977–81 he was Secretary of the Inorganic Chemistry Division and Vice President and President-Elect of the Division (1981–85). At the Lyon General Assembly in September 1985 he became President of the Division — an office which he will hold until the next General Assembly in Boston, 1987. He has been a delegate of the National Adhering Organization of Japan at the IUPAC Council Meetings in 1979, 1981, 1983 and 1985.

A typical day in the life of Kurt Lechnitz

Kurt Lechnitz is Chairman of the Commission on Atmospheric Chemistry (VI.4). He works for Drägerwerk AG in Lübeck, Federal Republic of Germany, as manager of a department concerned with chemical gas measuring techniques. In this article he describes a typical working day in his life.

It was certainly not a typical day in my life when I visited the IUPAC offices in Oxford recently. But it was a very enjoyable day, as I had the opportunity to discuss several matters with Dr Freemantle, Mr Gujral, Ms Troughton and Dr Williams. Our meeting was almost over, when the Editor of *Chemistry International*, Dr Freemantle asked me to think about a typical day in my life and perhaps write something down for publication in the magazine.

To be honest, a typical day in my life can be very exciting but also frustrating. What is my daily routine? I normally get up at 6 a.m. I start my work around 7.30 a.m. and finish sometime between 5.30 and 8.30 p.m. On a normal day I leave the house at 7.15 a.m. and drive to work. I never know in advance when I shall be able to say goodbye to my office, turn off the lights and jump into my car to drive home. But the reader should not get me wrong, I really enjoy my work. Not all people in a large German company can expect to run their business within 38.5 hours per week. This is now the official working time in many organizations in our country. As manager of the main department of chemical gas measuring techniques, I am responsible for work in several laboratories. I have meetings with my department managers and group leaders. In between, I have to deal with the



Kurt Lechnitz in his office: 'There is an urgent need to make chemistry understandable to the lay person'.

incoming and outgoing correspondence. The most exciting part of my job is to cope with all the telephone calls. I receive calls from colleagues in our Lübeck company and also from our daughter companies in foreign countries. Users of gas measuring systems raise questions which have to be answered. When one reads these sentences, it may seem that the daily work of a manager in a

company of more than 5000 employees is somewhat uncoordinated. But don't worry, without a clear timetable one would be in trouble soon. For example, the meetings are well prepared by the secretaries or co-workers. For most of our meetings we have predetermined checklists of topics to be covered. Everybody will understand, however, that research and development cannot always be done according to checklists. Some of the best and most brilliant ideas have their source in so-called brainstorming situations. These are meetings which are not coordinated at all. An outsider may suspect these meetings are a waste of time and conducted merely to give the experts in the R&D departments a couple of nice, pleasantly relaxed hours. However, it is the results that count and these justify the procedure.

During my normal working hours there is no time left to write scientific articles. But I have sufficient time on business trips, when I spend hours in trains, planes or at airports. The weekends also give me an opportunity to write manuscripts. I present about ten papers each year at conferences, seminars and symposia and have between six and ten articles published annually.

Travelling, I think, is wonderful, but . . . business trips do not usually provide the most desirable forms of travel. Even so, a trip which allows the traveller to see nothing but the hotel and the meeting room can be very useful. It offers the chance to talk to many people and to become acquainted with the various characters and the completely different habits in other countries.

To meet other people, to exchange information and to deal with topics of chemistry are the reasons why I find IUPAC work so interesting. For the last five years I have devoted approximately 150 hours annually to IUPAC. In 1985 the total time was about 200 hours. This was due to all the additional activities to get our Commission on Atmospheric Chemistry re-established.

I read a great deal, including scientific journals and — because it is part of my job — budget figures and accounts. I especially like detective stories in English. In the forthcoming months I am looking forward to reading a number of books which I received as presents for my 25th anniversary of service with Drägerwerk in Lübeck. Books on the history of architecture are my favourites. When I read I can relax. I also relax with my family although my wife fully understands that my job does not leave too much spare time. However, if there is a chance, she does accompany me on trips. The IUPAC General Assemblies provide opportunities for my wife and me to travel together. I should not forget the sauna in our house. This is an ideal way of relaxing. I also jog in the forest near our house.

Dr Freemantle asked me what advice I could give

to young chemists. First of all, I think they should look beyond the boundaries of their field of work. They should be aware that in the news media chemistry receives very critical comments, particularly in respect of environmental problems. Every chemist should therefore feel obliged to make contributions to chemistry which do not burden our environment. I feel that there is an urgent need to make chemistry understandable to the lay person. Chemists should be able to talk to the general public in a language people understand. It must be made clear that chemistry is a science which is essential to improve living conditions.

Chemists should be willing to do voluntary work in international organizations. IUPAC is the right forum for such work. My final piece of advice therefore is addressed to all chemists involved in IUPAC activities. Our contribution should help to promote the image of chemistry so that it is accepted as a science which helps to improve the environment and living conditions. Every IUPAC member can help in this way and direct his or her activities accordingly.

In honour of Prof. Smets

In 1984, the Macromolecular Division held a Polymer Chemistry Meeting in honour of Prof. G. Smets to coincide with his retirement. Prof. Smets was the first Secretary of the Macromolecular Division (1967–75) and became Vice President of IUPAC (1975–77). He was President from 1977 to 1979.

The meeting, which was held at Katholieke Universiteit, Leuven, Belgium, 26–28 September 1984, was mainly devoted to block and graft copolymerization and mechanisms, polymer transformation reactions and polymer photochemistry. The invited lectures have been published under the title "Contributions in honour of G. Smets presented at the Polymer Chemistry Meeting at Leuven, Belgium" and appear as Supplement Vol. 13, August 1985 of *Macromolecular Chemistry and Physics*.

Professor Smets has made essential contributions to nearly all fields of macromolecular chemistry. Thus, he was one of the first to show successfully the possibilities of block- and graft-copolymerization by radical chain transfer reaction between a growing chain and a pre-existing polymer. By incorporating peroxide groups into polymers or by putting them at their end, several original methods of graft- and block-copolymerization by radical mechanisms were established years before anionic polymerization became the customary way to produce them. Later on, photochemical initiation procedures based on the photolysis of photosensitive side groups or

groups built into the polymer chain were also used.

Professor Smets' background in organic chemistry led him to his extensive studies of organic reactions on high polymers and intramolecular functional interactions, in the course of which he was one of the first to draw attention to the influence of the intramolecular structure and stereo-specificity of the polymers during the reaction and on the nature of group interaction.

The same thorough knowledge of organic chemistry and its recent progresses were at the origin of Professor Smets' interest in the synthesis of new polymers using recent methods of organic chemistry such as cyclodimerization, dipolar cycloadditions, carbene and azide reactions either for the preparation of new monomers followed by their polymerization or for direct polyaddition reactions.

Another of his many fields of interest was the synthesis and properties of photochromic polymers and copolymers. Incorporation of photochromic groups into a polymer molecule yielded deeper insight into the internal structure and the physical properties of polymers such as chain segment mobility and transition phenomena. He also observed photomechanical phenomena in the case of photochromic networks, which show photocontractile behaviour.

These phenomena led him to study several photochemical and thermal reactions, e.g. isomerization, dissociation, and recombination in solid polymer matrices, stressing the importance of the physical properties of the polymer medium on the course of these reactions. This is not an exhaustive survey, as Prof. Smets also treated problems like anionic polymerization and copolymerization and the synthesis of polyampholites, their complexation behaviour towards metal salts and their significance for selective membrane synthesis.



Prof. Smets at the General Assembly in Lyon.



Lord Todd speaking at the IUPAC Congress in Manchester.

A Time to Remember

On Monday 9 September 1985, Lord Todd formally opened the IUPAC Congress at the Palace Theatre in Manchester in UK. That Lord Todd should open the Congress was particularly appropriate. In 1938, Alexander Todd, then only 30 years old, was invited to become Director of the Chemistry Laboratories at Manchester University. Despite wartime shortages, Lord Todd managed to lay the foundation for nucleotide synthesis which later played a crucial role in determining the structure of DNA. In 1946 he left Manchester to become Professor of Chemistry at Cambridge University.

A general account of the life of Lord Todd of Trumpington is recorded in his autobiography *A Time to Remember*. The autobiography emphasizes the events that shaped his career as a distinguished scientist. In 1957 Alexander Todd was awarded the Nobel Prize for chemistry. From 1963 to 1965 he was President of IUPAC and for five years President of Royal Society.

The autobiography is published by Cambridge University Press, UK (1983). ISBN 0 521 25593 7. 257 pp. Price £15.00.

IUPACRONYMS and abbreviations

Prof. J. Reedijk

Introduction

A recent editorial in this journal¹ drew attention to the use and misuse of abbreviations within the International Union of Pure and Applied Chemistry (IUPAC). The new AAS (Affiliate Affairs Secretary) humorously suggested that a new committee be set up to deal with the usage of acronyms and other abbreviations. In fact one of IUPAC's committees — the Interdivisional Committee on Nomenclature and Symbols (IDCNS) — has been and still is giving attention to this matter. At its Lyon meeting, the committee decided to draw attention — again — to one of its early publications, dealing with the use of abbreviations in the chemical literature². The aim of this contribution is to update and refresh the memories of IUPAC committee members and to call for a proper use of acronyms and abbreviations.



Prof. Reedijk.

Why abbreviations?

Communications between scientists working in more or less the same area is optimized by the use of abbreviated terms. Without acronyms certain scientific papers would be unreadable. Communication would be seriously hampered if acronyms like DNA, NMR, HPLC, LASER, FTIR, EXAFS were not available. In fact chemists use acronyms and symbols all the time in chemical formulae, for example, H_2O , $\text{UO}_2(\text{NO}_3)_2$; BN.

Proliferation and misunderstanding

Increasing contacts, collaboration and thus communication between the different subdisciplines, requires the use of acronyms. On the other hand communications may be seriously hampered if acronyms of different meaning are used. Some examples known to cause confusion are:

AES	Atomic Emission Spectroscopy; Auger Electron Spectroscopy
DNMR	Dynamic NMR; Deuterium NMR
TPP	Tetraphenylporphyrin, Triphenyl Phosphate, Triphenyl Phosphine

Recently others^{3,4,5} have pointed towards this problem. Several examples leading to misunderstanding have been listed.

Basic rules for using acronyms and abbreviations

1. Restrict the number of abbreviations and acronyms as far as possible, especially in textbooks, general publications, reviews.
2. Avoid the use of abbreviations in titles and abstracts of paper.
3. Never use 'new' abbreviations for terms that have a generally accepted acronym (DNA, NMR, ESR, HPLC, etc.).
4. Avoid abbreviations that may lead to confusion or misunderstanding, or that are based on incorrect use of grammar or language.
5. Explain the abbreviation when it appears for the first time in a document or paper, or — preferably — explain all abbreviations used at a proper place (near the beginning) or in a table of the paper. This practice is increasingly being followed by journal editors.
6. The style of the abbreviations used should conform to the practice of a certain area, for example, lower case letters for ligand abbreviations in coordination chemistry should be used. The style should also follow rules given for symbols, for example, for units defined by *Système Internationale* (SI). Longstanding, well-established practices of journals in using abbreviations should of course be followed. Some journals use capitals — with or without full stops — whilst others use lower case letters, for example; NMR; N.M.R.; nmr.

IUPAC policy

First of all IUPAC Committee and Commission members are reminded to consult an earlier paper² which has a listing of IUPAC publications in several areas and contains instructions for the use of acronyms and abbreviations. Many recent publications in *Pure and Applied Chemistry* (PAC) also contain useful information. There is no general style in using abbreviations prescribed by IUPAC or IDCNS. Nevertheless, IUPAC Commissions, especially those dealing with nomenclature, are reminded that:

1. Commissions are encouraged to examine periodically the use of abbreviations in their area and to compile appropriate recommendations for IDCNS consideration;
2. All IUPAC documents should have a list of abbreviations at the beginning of the document;
3. IUPAC recognizes *recommended* abbreviations, the use of which without explanation is permissible (DNA, NMR, LASER, for example), and *acceptable* abbreviations the use of which in general (and IUPAC) papers is possible only after proper definition. However, frequent usage may occur and is acceptable without explanation in specialized journals.

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Atoms, energy and industry: two centuries of Manchester science

Stella Butler

The IUPAC Congress held in Manchester, UK, 9–13 September 1985, included a historical exhibition entitled '200 Years of Manchester Science'. The exhibition, which was provided by the Greater Manchester Museum of Science and Industry, included 15 graphic panels together with two showcases displaying instruments and objects from the museum's collection. It was set up in the lobby of the Renold Building at the University of Manchester Institute of Science and Technology, where the majority of congress meetings were held. In this article, Stella Butler, Curator of Science at the Museum describes the exhibition and its underlying themes.

To display and explain the history of Manchester science over the past two hundred years in a few brief panels is rather like writing the history of modern civilization in a single essay. Only the broadest outline, with highlights of the most outstanding achievements is possible in such a restricted format. Nevertheless we aimed to demonstrate Manchester's importance, particularly during the nineteenth century, as a centre for research which has proved fundamental to our modern understanding of the physical world. One of the main underlying themes to the exhibition was the changing social structure of the scientific world. The gentlemanly Literary and Philosophical Society ("Lit. and Phil.") of the late eighteenth century was a very different arena in which to pursue scientific investigations to the highly professionalized world of the twentieth century academic scientist. The exhibition used this theme to give structure to what could have become simply a roll-call of great men.

The first section of the display focused on late eighteenth century Manchester and the dramatic changes wrought by the industrial revolution. The Literary and Philosophical Society, founded in 1781, was part of the development of the new social order emerging from the major economic upheavals associated with the establishment of the factory system. The most famous figure associated with the "Lit. and Phil." in its early decades was John Dalton, who came to Manchester in 1791 to teach mathematics and natural philosophy at the dissenting academy. While in Man-

chester Dalton developed his ideas about the physical structure of matter, presenting the "Lit. and Phil." with his suggestions in the form of lectures and papers published in the Society's *Memoirs*. Between 1803 and 1808 he articulated fully his belief that elements are made up of atoms — each element being structured of distinct particle types — and that the formation of compounds can be explained by the combination of different types of atoms. Some of Dalton's apparatus and personal possessions were displayed in the exhibition together with copies of his famous scientific texts.

The apparatus of Dalton's pupil, James Joule, was also displayed. Through meticulous and imaginative



John Dalton.



The exhibition.

experiments Joule established that the heat evolved when a paddle wheel is turned in water is equivalent to the mechanical work done in moving the paddlewheel. The fineness of the capillaries in the thermometers he used to measure changes in temperature demonstrate the care he took in selecting his scientific instruments.

The mid-nineteenth century scientific community to which Joule belonged included both men of independent means and those employed in various capacities as "scientists". By the end of the century science was becoming a more exclusive and professionalized occupation. In Manchester, Owens College, later the Victoria University, established several research laboratories after 1860. Henry Roscoe's chemistry department became an important training ground for the local chemical industry. Important work on the chemistry of dyestuffs was carried out in this laboratory. However, there can be no doubt that the most distinguished scientific figure in the University before the First World War was the Langworthy Professor of Physics from 1906–19, Ernest Rutherford.



Ernest Rutherford (left), Niels Bohr (right) and their wives in Manchester, c. 1910.

When Rutherford came to Manchester, he was already a physicist of international renown. He attracted to the physics department a group of highly talented scientists. Together they suggested that the atom is a positively charged central nucleus surrounded by electrons orbiting this nucleus in various "energy levels." Their suggestions were based on data from experiments requiring delicate techniques and infinite patience. Examples of the kind of apparatus involved were illustrated.

More recent developments were highlighted also. In 1948 a group of electrical engineers, many of whom had worked on radar and telecommunications during the Second World War, assembled the first operational stored-program computer. This formed the prototype for the Ferranti Mark 1, the world's first commercial model. Since this breakthrough, Manchester University Computer Science Department has made major contributions to the development of various machines in co-operation with Ferranti, Metropolitan-Vickers and International Computers Ltd. Today micro-circuits are designed and produced on wafers of silicon using photographic techniques, at Ferranti's Chadderton laboratories.

The exhibition aimed to give a brief glimpse of events which have had international significance. The role of local scientists in the development of dyestuffs was explored in more detail in The Perkin Division's session on "Dyestuffs — Past, Present and Future" which was organized in association with the Historical Group of the Royal Society of Chemistry.

Manchester has been the home of some of the most gifted scientists of the last two decades. There could have been few more appropriate cities to act as host to the IUPAC Congress.

Photos courtesy of the Greater Manchester Museum of Science and Industry.

Commission & Committee News

Can you name your cluster?

This is one of the questions posed in this review of the work of the Commission on Nomenclature of Inorganic Chemistry (II.2) or CNIC for short. The review is based on the 1985 Newsletter published by the Commission.

Introduction

CNIC was formed to eliminate the Tower of Chemical Babel! Almost every chemist has both appreciated and despised the tedium of the systematic and proper chemical nomenclature that CNIC is obliged to generate. In this second era of the computer evolution, names, formulae, and the like are constrained by the inevitable super-literal reaction of the computer. With sympathy, but because precision and uniformity are increasingly important, we will just point out a few conventions that deserve to be observed:

1. Representatives from all over the world agreed years ago (1970) to name the coordinated water molecule 'aqua'. Please do not call it 'aquo'.
2. When numerical prefixes are used in naming a *coordination entity*, all vowels remain in the name. In technicalese: "there is no elision of vowels". For example $[\text{Al}(\text{H}_2\text{O})_6]^{3+}$ is hexaaquaaluminium (3+) ion.
3. This should not seem odd but it seems to cause some problems. The formulae of the common oxoanions are considered to be *coordination formulae*. Consequently, they are not enclosed in square brackets, but rather in parentheses: $[\text{Ni}(\text{H}_2\text{O})_6](\text{ClO}_4)_2$.

Recently Published Documents

In addition to a book of nomenclature¹, the Commission has published several documents about topics that have evolved since 1970. The recommendations that have been published since 1982 deal with isotopically labelled and isotopically substituted compounds², inorganic and coordination polymers³ (joint activity with the Nomenclature Commission of the Macromolecular Division, IV.1), and nitrogen hydrides⁴. Short summaries of these recommendations are given below.

Isotopically Labelled and Isotopically Substituted Compounds²

These rules provide a general system of nomenclature for inorganic compounds whose isotopic nuclide composition deviates from that which occurs in nature. They are also suitable for designating individual iso-

topic molecular species. An isotopically modified organic residue occurring in an inorganic compound, such as an organic ligand in a coordination entity, is named according to the rules of the Nomenclature of Organic Chemistry.

There is one other general system in use for describing isotopically modified compounds. It is based on an extension of the principles proposed by Boughton for designating compounds containing hydrogen isotopes, and, although mainly used in the index nomenclature of the Chemical Abstracts Service, it is found in the literature and in some chemical catalogues.

The system of nomenclature for isotopically modified inorganic compounds codified in these rules provides for recognition of various types of isotopic modification, and thus was chosen over the system based on the Boughton principles.

Inorganic and Coordination Polymers

The Fundamental principles of polymer nomenclature, which were developed to provide a framework for the unambiguous systematic naming of single-strand organic polymers, are extended to embrace inorganic and coordination polymers. The structures treated are regular single-strand polymers, that is polymers comprising repeating units linked exclusively through single atoms, and regular quasi-single-strand polymers, in which each repeating unit terminates at a single atom on one side but at a plurality of atoms on the other.

The name of the polymer is the name of the constitutional repeating unit (CRU) prefixed by the terms 'poly', 'catena', or other appropriate structural indicator. The CRU is in turn named by citing, in order of appearance along the chain of its constituent subunits, which are the largest structural fragments of the CRU that can be named according to established principles of inorganic and/or coordination nomenclature.

The document contains rules for the identification and orientation of the CRU. It also contains many examples of inorganic/coordination polymer structures together with the recommended names.

Nitrogen Hydrides⁴

These rules apply mainly to nitrogen hydrides containing one or two nitrogen atoms. The hydrides are considered as inorganic, although many of their derivatives are organic: the rules compromise between the relevant systems of nomenclature.

The benefit of a systematic nomenclature based on the name 'azane' for NH_3 and the atom name 'nitrogen' is outlined. However, due to common practice, names derived from "ammonia" (NH_3), 'hydrazine' (N_2H_4), 'diazene' (N_2H_2), and 'nitrogen' (N) are retained for present use. The cations derived from the nitrogen hydrides by the addition of one or two hydrogen ions are named using the 'ium' ending. The anions derived by the loss of one or more hydrogen ions are named using the 'ide' ending in the established manner. The anions resulting from the loss of all hydrogen as ions from the nitrogen hydrides are named from the atom; for example, nitride (N^{3-}). The problem of naming ligands N_nH_m attached to transition metal ions where the actual valence bond structure of the ligand is indeterminate has been explored. The rules recommend that N_nH_m ligands should be named as neutral molecular species where possible, otherwise as anions, zwitterions or cationic ligands in that order of priority, but not as radicals.

Ongoing Activities

Due to many new fields and to the discovery of many new types of compounds since the publication of the Red Book (1970), it was felt necessary to completely revise the Rules for Nomenclature in Inorganic Chemistry. The Commission has agreed to publish a basic manual with the following contents:

1. Aims, Function, and Methods
2. Grammar
3. Elements and Symbols
4. Formulae
5. Stoichiometric Names
6. Solid State Chemistry
7. Neutral Molecular Compounds
8. Ions, Radicals, and Salts
9. Oxacids
10. Coordination Compounds
11. Boron Compounds

In addition to this basic material, the Commission intends to publish a Part II, made of chapters dealing with more advanced and detailed recommendations covering more specialized fields such as those mentioned above^{2,3,4}, heteropolyanions⁵, organometallic compounds, inorganic rings and chains (all in preparation).

Individual chemists are encouraged to write to the Commission if they have ideas or suggestions about these topics or to include other subjects, or if they feel that a particular field is lacking accepted rules of nomenclature.

Write to us

IUPAC's CNIC consists of volunteer chemists from throughout the world. Since nomenclature is our responsibility, we invite your inquiries and suggestions. We can serve you best if we know your needs and opinions. At worst, we should know someone who can name your cluster — or your ligand! Of course, some people already bring us their questions. Chemists are invited to write about inorganic chemistry nomenclature problems to the present Chairman:

Prof. Daryle H. Busch
Department of Chemistry
The Ohio State University
140 West 18th Avenue
Columbus
Ohio 43210
USA

or to any of its members.

References

1. IUPAC *Nomenclature of Inorganic Chemistry*, (1970), 2nd Edn, Butterworths, London, 1971.
2. Nomenclature of Isotopically Modified Compounds. *PAC*, Vol. 53, p. 1887, 1981.
3. Nomenclature for Regular Single-Strand and Quasi-Single-Strand Inorganic and Coordination Polymers. *PAC*, Vol. 57, p. 149, 1985.
4. The Nomenclature of Hydrides of Nitrogen and Derived Cations, Anions, and Ligands. *PAC*, Vol. 54, p. 2545, 1982.
5. Nomenclature of Heteropolyanions, in preparation (1986).
6. Present Titular Members of the Committee are: D. H. Busch (chairman), E. Fluck, E. Samuel, P. Fodor-Csányi, R. Laitinen, J. F. Nixon, J. Reedijk and T. E. Sloan.

New section recommended

The question of Medicinal Chemistry, which was formerly covered by the now suspended Commission III.4, was discussed at length at the Organic Chemistry Division Meeting in Lyon. It was decided to recommend to the Bureau its incorporation into a new Section, responsible to the Bureau.

Various applications for symposia in the ongoing series were considered and the following recommended for sponsorship for the immediate coming years: Natural Products, XVI Kyoto, Japan, 1988; Organometallic Chemistry directed towards Organic Synthesis, Vancouver, Canada, 1987; Conference on Heteroatom Chemistry, Iharaki, Japan, 1987. Preliminary plans for several other symposia were also reviewed. Official representatives to several forthcoming symposia, approved in recent years, were appointed.

The next meeting will be held in Boston, USA, 21–29 August 1987.

S. Dev

Bird's Eye View of the Commission of Electroanalytical Chemistry (V.5)

Commission V.5 was established twenty-two years ago. It has currently 18 Titular and Associate Members plus 18 national representatives. The terms of reference include the following:

1. to advise IUPAC on matters relating to electroanalytical chemistry; to survey the status of research and development, and promote the advancement of the field;
2. to make recommendations on relevant definitions, nomenclature, standards and standardization procedures;
3. to encourage and participate actively in the preparation and publication of authoritative reports and monographs, including data tabulations and outlines of recommended procedures;
4. to disseminate information and act as a coordinating body for electroanalytical chemistry throughout the world.

To discharge these tasks, the Commission is currently pursuing a wide variety of projects, which are as diverse as the needs of the international community of electroanalytical chemists. The range of activities has encompassed fundamental definitions, methodological developments, significant applications and compilation of data based on extrathermodynamic assumptions. A representative sampling illustrates the point:

Definition of pH scales in various solvents
Diffusion coefficients of metals in mercury
Standard potentials of amalgam electrodes
Procedures for testing pH-responsive glass electrodes
Applications of ion selective electrodes in non-aqueous solvents
Critical comparison of voltammetric indicator electrodes
Electroanalytical chemistry of sulfur compounds in the new coal conversion technologies
Enthalpies of transfer of ions from one solvent to another

The Commission has sponsored fifteen nomenclature and factual reports which have appeared in *PAC (Pure and Applied Chemistry)* during the last two years. However, the most distinctive feature of the Commission's program is the publication of authoritative reference books. Thus, the paperback monograph *Recommended Methods for Purification of Solvents and Tests for Impurities* (Pergamon Press, Oxford, 1982) was sold out by 1984 and reprinted. An 800-page hardcover volume on *Standard Potentials in Aqueous Solution* (Marcel Dekker, New York, 1985) represents the culmination of an eight-year joint effort by Commissions I.3 and V.5, providing an up-to-date critical summary of contemporary knowledge of redox potentials. Another unique endeavor of Commission V.5 is an *Anthology of Chinese Translations of Selected Reports of the Commission on Electroanalytical Chemistry* (Fujian Science and Technology Publishing House, Vol. 1, 1984). Commission V.5 has also contributed to a major cooperative project launched by the Analytical Chemistry Division Committee of IUPAC devoted to the determination of trace elements in natural waters. In support of that effort Commission V.5 has established a Subcommittee on Electroanalytical Methods of Environmental Trace Analysis.

The overall philosophy of the Commission on Electroanalytical Chemistry has been to use an eclectic approach, predicated on an overriding criterion: to best serve the global community of chemists in the spirit of international cooperation which is the *raison d'être* of IUPAC.

J. Jordan

Book on physicochemical measurements and standards to be published

The Subcommittee on Physicochemical Measurements and Standards (formerly Commission I.4) is preparing a book on "Recommended reference materials for the realization of physicochemical properties". The book will contain a general introduction and 17 chapters, each devoted to a particular property. The properties covered are density, enthalpy, electrical conductivity, humidity, optical refraction, optical rotation, permittivity, potentiometric ion activities, *PVT* relationships, reflectance, relative molecular mass, surface tension, temperature, testing distillation columns,

thermal conductivity, viscosity, and wavelength and transmittance. All but one of the chapters are now completed in draft form and many are ready in the form of camera-ready copy produced by a laser printer. The copy is of high quality and indistinguishable from that produced by traditional typesetting. The book promises to be worthy of the effort of its 21 collaborators and many contributors. Each chapter will be refereed by an independent expert before final publication, which is expected to be in June 1986.

After publication of the above book the Subcom-

mittee will be dissolved. At their Lyon meeting members expressed considerable disquiet that the subject of Reference Materials would then cease to have a distinct place in IUPAC activities, although individual Commissions might discuss reference materials related to their own interests. There was growing international interest in reference materials and it was felt that IUPAC should have formal (as opposed to fortuitous) representation on the committees of the International Organization for Standardization (ISO) and the Organisation Internationale de Métrologie Légale (OIML) concerned with this subject. Moreover, it was considered that there should be a small group within IUPAC charged with the following responsibilities:

1. co-ordinating the activities on the formulation of recommendations on reference materials within the Physical Chemistry Division;
2. collecting information from other international bodies in the field of reference materials and

- disseminating it to the relevant IUPAC bodies;
3. encouraging activity on reference materials within IUPAC generally and bringing these activities to the attention of international bodies;
4. monitoring activities in the field of reference materials and, when appropriate, recommending to the Physical Chemistry Divisional Committee that a divisional sub-committee on Physicochemical Measurements and Standards be reactivated.

These recommendations were accepted by the Physical Chemistry Divisional Committee and a Working Group was set up.

The Subcommittee will have been dissolved before the 34th General Assembly but a small group will meet in April 1986 to finalize the publication of the book. The Working Group on Reference Materials will meet in Boston, USA, in 1987.

A. J. Head

Safety aspects in chemical industry

Safety aspects in chemical industry and the involvement of IUPAC in this important matter were extensively debated when the Committee on Chemistry and Industry (COCI) met at the General Assembly in Lyon. The preliminary results can be summarized as follows:

- The Committee agreed that IUPAC should take action in this area. It was felt that the Union could make valuable contributions on an international level during a longer period.
- Possible activities should be focused on safety in the manufacturing of chemicals.
- The subject would also be feasible for IUPAC conferences — primarily in the areas of education and information. Since chemical research is not the main item, it appears not to be an appropriate topic for a conference within the CHEMRAWN series. However, IUPAC should make use of the experience of the CHEMRAWN Committee.
- It was recommended that, as a first step, a "study group" should be set up within the Union to discuss what has been done and what could be done and the further steps in more detail.

A paper dealing with the safety aspects in the Japanese chemical industry was presented by Dr Nukada.

From the point of view of chemical industry the Committee thought it desirable to harmonize the classification of chemical compounds in order to avoid problems which could arise by using different nomenclatures. The Committee therefore agreed that IUPAC should be asked to authorize the Commissions on Nomenclature to act as adviser(s) to authorities in legal difficulties. First contacts



Prof. Büchel, Chairman (left) and Dr Jager, Secretary (right) at the COCI meeting in Lyon.

between COCI and Commission III.1 have already been established.

A new document for the recruitment of Company Associates (CAs) prepared by Dr Agius was accepted by the Committee. The Committee recommended that an updated list of all Company Associates be added to the document. Furthermore, the name "Committee on Chemistry and Industry" should be used as a subtitle. The document should be published as soon as possible in *C/*. Reprints would be distributed to interested companies.

The consequences of the planned increase of the CA subscription unit from the beginning of 1986 were discussed. As a result of that discussion COCI strongly recommended not to increase the unit size

at the present time. Changes in the CA unit size should be postponed to 1988. Efforts in recruiting new Company Associates should be strengthened.

The Committee members have been informed about the progress made in the preparation of *CHEMRAWN V* (Contributions of Chemistry to Health, FRG, 1986) and *CHEMRAWN VI* (Advanced Materials for Innovation, Japan, 1987) by Prof. Büchel and Dr Uchida, respectively. It is planned to combine the *CHEMRAWN VI* with an exhibition of advanced materials. COCI was invited to recommend suitable speakers for each session of *CHEMRAWN VI*.

Following a request by Dr Kearney (Division of Applied Chemistry) COCI agreed to recommend scientists from industry to serve on the Commission on Biotechnology (VI.2). A list of appropriate candidates will be sent to him in due course.

COCI agreed to request Division VI to set up a working group within the Commission on Food Chemistry (VI.1) with the task of preparing a tolerance list (based on available data) of by-products in food.

The next meeting will be held in Leverkusen, FRG, 19 September 1986.

G. Jäger

Commission V.1 takes major initiatives in the field of chemometrics

The Commission on Analytical Reaction and Reagents (V.1) is the oldest Analytical Division Commission and celebrated its 50th anniversary at Mogilany, Poland last summer. Material is being collected to produce a short written account of the Commission.

Since Lyngby, two publications have appeared. In Lyon a further three were accepted by the Commission: *Characteristics of Liquid Stationary Phases and Column Evaluation for Gas Chromatography*, *Metal Buffers — Chemical Analysis*, and *Organic Reagents in Nuclear Magnetic Resonance Spectroscopy*.

The Commission decided to focus its main attention on the organic analytical reagents project on the use for inorganic analysis. The project comprises several parts, three of which should be finalized next summer. New projects accepted by the Commission were: 'Classification and characterization of extraction systems for analytical chemical purposes'; 'Classification and characterization of chemical sensors', and 'Analytical application of macrocycles'. A feasibility study is to be made into the classification of stationary phases for HPLC.

A major new initiative, of significance to the Commission, the Analytical Division, and the Union at large, was the decision to establish a Working Group on Chemometrics. The initial terms of



Commission V.1 in Lyon.

reference are to examine and report on optimization algorithms and expert systems, pattern recognition, evaluation of performance criteria, publication and validation of software.

The next meeting will be held in Czechoslovakia either 16–19 August or 19–22 September dependent on availability of a restful, conducive to work, country location.

G. Ackermann
D. Thorburn Burns

New guidelines for assessments of atomic weights

Thirty-four changes in atomic weight values and uncertainties were recommended when the Commission on Atomic Weights and Isotopic Abundances (II.1) met in Lyon. These were reported in *CI* 1985, No. 6, p. 30.

Many of these changes were made necessary by a consideration of the recently published Atomic Mass Table. A discussion of the reasons for these changes and the detailed Table of Standard Atomic Weights will appear in the Commission's full biennial report to be published in *Pure and Applied*

Chemistry (PAC). Although a number of changes were made to the Table of Isotopic Compositions for the Elements, it was decided not to republish this table in 1985.

The Commission noted with interest that the Element-by-Element Review of changes which have been made to the atomic weight values since 1961 was published in *PAC* in 1983. This concluded the work of the Subcommittee for the Assessment of Isotopic Composition which was formally disbanded at the Lyngby meeting in 1983.

The Working Party on Uncertainties which had been established at the Lyngby meeting presented their Report to the Commission. The Report recommended a number of Technical Guidelines which were adopted as the basis for future work of Commission II.1. The Working Party on Uncertainties was formally disbanded. The Commission also considered a detailed report by the Working Party on Non-Terrestrial Materials and decided not to include a summary of their work in the Biennial Report and asked the Working Party to make a further report to the next meeting.

The Commission formed a new "Subcommittee for Isotopic Abundance Measurements" (SIAM) to evaluate new experimental techniques for determining atomic weights and isotope abundances and to monitor new isotopic composition measurements. The Commission also established two new Working Parties. One on "Measurements, Sensors and Measuring Instruments" will act on behalf of the Division. The second is a Working Party on "Natural Isotopic Fractionation", which will evaluate possible limitations on atomic weights imposed by natural fractionation mechanisms.

J. R. De Laeter

Solubility Data

The Lyon meeting of the Commission on Solubility Data (V.8) was attended by 55 Commission and Subcommittee members, the largest number of participants since the Commission's establishment six years ago.

Since the last meeting of the Commission in August 1984, in London, Ontario, Canada, a new contract for the publication of the *Solubility Data Series* was signed with Pergamon Press, making it the only publication of the Union remaining with this publisher. The new contract calls for the continued publication of 4–6 volumes, 1500–3000 pages per year. All the elements necessary for the establishment of a pilot project on a numerical database have been formulated and a proposal submitted to the Committee on Databases of the



Commission on Solubility Data (V.8) meeting in Lyon.



Union for approval and funding. In view of the increasing interest in the Commission's scientific work, it appeared desirable to establish one, or perhaps two Solubility Data Research and Information Centers outside the USA, in addition to the one in operation at Emory University, Atlanta, USA. The scientific and organizational programmes of the Second International Symposium on Solubility Phenomena, 12–15 August 1986, Newark, NJ, USA have been discussed and approved.

By the end of 1985 at least 22 and possibly 23 volumes were expected to be published. The manuscript for Volume 24 on *Propane, Butane and 2-Methylpropane* (Ed. W. Hayduk) was submitted in May 1985. Additional volumes to be submitted by the end of 1986 include *Hydrocarbons C₅–C₇*; *Hydrocarbons C₈–C₃₆*; *Halogenated Aliphatic Hydrocarbons and Water*; *Methane*; *Hydrogen Sulfide and Hydrogen Selenide*; *Alkali Metal Alkanoates*; *Alkali Metal Halides in Alcohols*; *Alkali Metal Chlorides in Water*; *Alkaline Earth Metal Halates*; *Metals in Mercury*; *Transition Metal Sulfites, Selenites and Tellurites*; *Alkaline Earth Metal Sulfates* and *Beryllium, Strontium, Barium and Radium*.

The next meeting will be held at the New Jersey Institute of Technology, Newark, NJ, USA, 9–11 August 1986.

A. S. Kertes

Teaching Clinical Chemistry

The main business of the Lyon meeting of the Teaching Commission (VII.3) of the Clinical Chemistry Division fell into three categories: presentation of progress reports on current projects, the initiation of new projects and reports on training programmes, seminars and workshops in which members of the Commission have been or are involved.

Since the last General Assembly the Commission has been working on six projects recognized by IUPAC. Of these, one ("Preparation of reference catalogue and audio visual and bibliographical material for teaching in clinical chemistry") is an ongoing project and the material continues to be amassed in this catalogue. Of the remainder, "A basic education and training framework for medicinal laboratory technicians in clinical chemistry" has now been completed and published in *Pure and Applied Chemistry (PAC)*. Three further projects, "Certification, licensure and accreditation programmes for clinical chemistry", "Teaching

guidelines for clinical chemists for effective communication of laboratory data" and "Guidelines for teaching clinical chemistry to medical students" are also complete and manuscripts have been presented for publication in *PAC*. The remaining project, "Drug effects in clinical chemistry: educational aspects", is a joint project with the Expert Panel on Drug Effects of the International Federation of Clinical Chemists (IFCC). The Commission has produced a recommendation which is now being considered by the Expert Panel.

Seven topics were considered and discussed as potential new projects of which four were selected for submission to the Divisional Committee. These were: "The clinical chemists' role in laboratory safety", "A syllabus for clinical chemistry training in laboratory management"; "An objective based set of syllabi for clinical chemistry" and "Guidelines for the compilation of clinical chemistry method manuals". The last of these projects will be considered jointly with the Commission on Automation and Clinical Techniques (VII.1). A further project was considered on guidelines for the use of molar (SI) units in clinical chemistry and was discussed with members of the Commission on Quantities and Units (VII.2). It was agreed that this Commission should initiate the project and

would work in close co-operation with the Teaching Commission.

During the last biennium the Commission has been responsible for the placement of two IFCC Visiting Lecturers, one to Spain and Portugal and the other to Colombia. This is a project sponsored by IFCC but organized by the Teaching Commission whereby eminent clinical chemists by invitation visit other countries for a period of approximately three weeks giving lectures, seminars and visiting laboratories. Other possible visits are currently being organized to Egypt, South Africa and Hungary. Members of the Commission have been involved in the organization and participation of teaching symposia at national and international meetings in Mexico and Rio de Janeiro and were responsible for a workshop at the 3rd Asian/Pacific Congress of Clinical Chemistry, Bali, September 1985. In addition, the Commission is involved with a major long-term teaching programme in Mexico. This is a three-year project supported by the Panamerican Health Organization, the Mexican Government and the British Council whereby training courses will be organized at six monthly intervals. The first of these is due to take place in November 1985.

H. G. J. Worth

Document on solution properties completed

The Commission on Macromolecular Nomenclature (IV.1) examined in detail a revised draft entitled *Definitions of Basic Terms Relating to Individual Macromolecules, Their Assemblies, and Dilute Polymer Solutions* when it met in Lyon, France, 31 August–5 September 1985. The document offers definitions dealing with such key aspects of polymer science as molecular weight and its distributions, dimensions of macromolecules, thermodynamic properties, viscosity, light scattering, fractionation processes, and so on. Of special importance is the recommended substitution of the terms "uniform polymer" and "non-uniform polymer" for the current terms "monodisperse polymer" and "polydisperse polymer", which are entrenched but incorrect. After some further changes, the Commission unanimously voted to approve this important new document and to submit it to IUPAC for public comment and publication.

The Commission noted that its long-awaited document on *Source-Based Nomenclature for Copolymers* was to be published in the October 1985 issue of *PAC*, and that three other documents (dealing with crystalline polymers, with the polymerization of chiral monomers, and the

classification of polymers) are now open for public comment prior to publication. Good progress was also made on classifying and defining polymerization reactions and on providing definitions of basic terms dealing with polymers in the bulk state and in melts.

The Commission decided to publish a note dealing with the use of abbreviations for polymeric substances, stating that it will not seek to systematize current usage. It also decided to expand its efforts to devise a nomenclature for chemically modified polymers using modifications of structure-based nomenclature, and for crosslinked polymers. A thorough revision of the basic definitions dealing with polymers, published in 1974, is also being contemplated. A note asking for comments on the current definitions from the scientific public will be published.

Copies of any of the documents mentioned above may be obtained from the Secretary of the Commission, Dr M. M. Bikales, National Science Foundation, Washington, DC 20550, USA.

The next meeting will be held at Schloss Reinhartshausen, FRG, 25–29 August 1986.

M. M. Bikales

"Publication process is working well"

The Interdivisional Committee on Nomenclature and Symbols (IDCNS) reviewed the nomenclature, terminology, and symbols work of the IUPAC

Commissions and of related international bodies at its meeting in Lyon, 29–30 August 1985. Twenty documents from Commissions were approved

during the preceding year, and two documents were approved at the Lyon meeting. The current publication process was found to be working well, with elapsed time between first submission of a document and its final approval for publication in *Pure and Applied Chemistry (PAC)* no greater or even less than under the previous "two-tier" process. Eighteen active Regional Centres are providing a wider distribution of provisional documents and increased publicity for IUPAC. Commissions were urged to cite superceded documents as such in their current documents and compendia.

In other matters, the Committee noted that the Compendium of IUPAC-Approved Definitions, which was being compiled by the late Prof. Gold, is about 60 per cent complete. The problem of acronyms in scientific reports was discussed; an IDCNS-sponsored publication on this subject is planned. Interaction between the Committee and the sponsors of the international metrology vocabulary has been strengthened by the appoint-



Dr Loening,
Chairman of IDCNS.

ment of Prof. H. P. Lehmann as liaison between the two bodies.

The Committee greatly regrets the loss of the service of two of its most active members through the retirement of Prof. David Whiffen and the untimely death of Prof. Victor Gold.

R. B. Fox

Applied chemistry projects for developing countries

When the Applied Chemistry Division Committee met in Lyon, France, 30 August–4 September 1985 they were of the view that one member of the Division should be on the Bureau and nomination was to be sought through the appropriate National Adhering Organization. Problems of organization within the Commissions of the Division appeared to have been resolved, by considerable effort, in the formation of the two new Commissions on Water and Atmospheric Chemistry. Chemical analysis will continue to play an important part of the work of all the Commissions thus justifying the description of "Applied Chemistry" to the Division.

Members of the various Commissions reported their observations at the meeting:

- VI.1 The Food Chemistry Commission is functioning well, through its working groups. They are investigating mycotoxin contamination and elemental analyses.
- VI.2 International experts in biotechnology have been assembled to establish a new, broader programme for the Commission. This will include characterization of biochemical reactions; defining terms, values and measurements and assessment of projects and raw materials. The global interest in modern biotechnology demands that the Union has a strong representation in this area of chemistry.
- VI.3 The Commission on Oil, Fats and their Derivatives continues to investigate a wide variety of topics concerning analyses technology by advanced techniques. The efficient activity of the Commission has contributed to the realization of fundamental

objectives of the Division.

- VI.4 The new Atmospheric Chemistry Commission has made a good start with a team of international experts. Five proposed projects ranging from diffuse sampling techniques to making inventories of current tropospheric and work place sampling programmes have been studied. This early activity indicates that in future the new Commission should uphold the prestige of the Union. The programme is of major concern to industries in developed countries since it reflects directly the health of workers.
- VI.5 The work of the Pesticides Commission is pertinent and productive, embracing the fields of multi-residual methods of analysis; studies on the environmental behaviour of pesticides; the chemistry of mammalian pesticide transformation; aspects of safety and the interpretation of data for legislative and registration purposes. Liaison with certain other Commissions could be strengthened.
- VI.6 The new Commission on water chemistry will concentrate on areas of work, not being dealt with by other groups or organizations. This will include the preparation of definitive statements; production of guidelines, literature surveys and reviews; the stimulation of relevant research and the organization of international workshops.

L. E. Coles

Provisional Recommendations

IUPAC seeks your comments

In this section we publish synopses of IUPAC's latest provisional recommendations on nomenclature and symbols. All comments on these recommendations are welcome and will be taken into consideration. The final revised versions are published in *Pure and Applied Chemistry* and synopses of these published in *CI* as recent reports. If you would like to comment on the provisional recommendations please write to your nearest regional centre requesting a copy of the full report. Copies are not available from the Secretariat. The most up-to-date list of regional centres was published in *CI*, No. 1, p. 45, 1986.

Recommendations for the presentation of molecular parameter values for infrared and Raman intensity measurements

The field of basic and applied studies of infrared and Raman intensities is growing and more experimental data as well as theoretical works are appearing in the scientific literature. The aim of the document is to point out where lack of common definitions and common use of dynamical and spectroscopic quantities may give rise to confusion among various authors.

Dipole moment changes in infrared (or polarizability changes in the Raman) as determined from experimental spectra suffer from an experimental ambiguity of the choice of the sign. Calculations are employed to analyse the experimental data.

Glossary of terms used in photochemistry

The purpose of the Glossary is to provide definitions of terms and symbols commonly used in photochemistry in order to achieve consensus on the adoption of some definitions and on the abandonment of inadequate terms.

Photochemistry being an interdisciplinary area of science which involves, in addition to chemistry, such different fields as laser technology, spectroscopy, polymer science, solid state physics, biology, and medicine, just to name some of them, it has been necessary to reach compromises and, in some cases, to include alternative definitions used in different areas. The IUPAC Commission on Photochemistry wants to emphasize that it is not the purpose of this compilation to impose terms or rules which would hinder the freedom of choice in the use of terminology.

The general criterion adopted for the inclusion of a term has been: (i) its wide use in the present or past literature, and (ii) ambiguity or uncertainty in its usage. With very few exceptions concerning widely accepted terms, name reactions have been omitted.

Recommendations ask for a correct description of the sign of the various vibrational coordinates used and of the eigenvectors derived from the dynamical matrix. Moreover, when quantum mechanical calculations on infrared or Raman intensities are carried out, there is only one way the vibrational displacement can be forced. Recommendations clarify how and why one can use the correct way. *Comments on these recommendations are welcome and should be sent before the end of December 1986 to Prof. Willis B. Person, Department of Chemistry, University of Florida, Gainesville, Florida 32611, USA.*

New National/Regional Centre in Bulgaria

The following National/Regional Centre has now been added to the list published in *CI*, No. 1, p. 45, 1986.

Bulgaria

Prof. Dr O. Peshev,
Bulgarian Academy for Sciences,
Centre for Chemistry,
Academician G. Bonchev Street,
Building 11, 1040 Sofia,
Bulgaria.

The arrangement of entries is alphabetical and, in general, the criteria adopted by the Physical Organic Chemistry Commission has been followed (*cf.* 'Glossary of Terms Used in Physical Organic Chemistry', *PAC*, Vol. 55, pp. 1281–1371, 1983).

Comments on these recommendations are welcome and should be sent before the end of December to the Commission Secretary, Prof. Silvia E. Braslavsky, Max-Planck-Institut für Strahlenchemie, Stiftstrasse 34–36, D-4330 Mülheim/Ruhr 1, Federal Republic of Germany.

Prenol Nomenclature

The prenols are a group of alcohols containing one or more isoprene units, and are, with their esters, the biological precursors of the isoprenoids, a variety of compounds including terpenes and steroids that contain much of the carbon skeleton intact. The new recommendations do not replace any existing document, but set out to systematize existing practice, and to supplement it by paying full attention to the important stereochemistry of the prenols. The general terms are discussed and recommendations for indicating stereochemistry are made. Short-chain prenols that have established trivial names are listed, and the relationship of the prenols to the simplest juvenile hormones is indicated.

Nomenclature of glycoproteins, glycopeptides and peptidoglycans

This document provides a nomenclature for carbohydrates covalently linked to proteins or peptides.

Together with the glycolipids and lipopolysaccharides they compose the more general class of compounds known as glycoconjugates. Terms are defined both for the conjugates themselves and for their carbohydrate components, and the nature of the linkage between carbohydrate and protein or peptide is discussed. The peptidoglycans, a group of glycoconjugates found only in bacterial cell walls, are included in the recommendations. A new 'Short form' is proposed for representing the structures of complex carbohydrates as compactly as possible. As no recommendations on glycoproteins, glycopeptides and peptidoglycans have been published previously by IUPAC or IUB the new recommendations do not replace any existing document, but they follow established rules of biochemical nomenclature.

Comments on both recommendations are welcome and should be sent before the end of October 1986 to Dr A. Cornish-Bowden, Department of Biochemistry, University of Birmingham, POB 363, Birmingham B15 2TT, UK.

IUPAC Publications

French Translation of Glossary

A French translation of the "Glossary of Terms used in Physical Organic Chemistry" (1982 Revision) has appeared in *L'Actualité Chimique* (Supplement No. 6, June/July 1985). The glossary, which was compiled and edited by Prof. V. Gold in conjunction with the Commission on Physical Organic Chemistry (III.2), appeared in *PAC*, Vol. 55, No. 8, pp. 1281–1371, 1983.

Romanian translation of thermodynamics recommendations

Dr D. I. Marchidan, National Representative of Romania on Commission I.2 has prepared a Romanian translation of Appendix IV of the Manual of Symbols and Nomenclature for Physicochemical Quantities and Units: "Notation for states and processes, significance of the word *standard* in chemical thermodynamics, and remarks on commonly tabulated forms of thermodynamic functions" (Recommendations 1981. See *PAC*, Vol. 54, No. 6, pp. 1239–1250, 1982). The translation appeared in *Revista de Chimie*, Vol. 36, No. 8, pp. 762–766, 1985.

Organic Synthesis: An Interdisciplinary Challenge

This book includes 29 plenary lectures presented at the 5th IUPAC International Symposium on Organic Synthesis held in Freiburg i. Br. (FRG) on 27–30 August 1984. The four main themes of the symposium were

- Modern methodology in organic synthesis
- Transition metals in organic synthesis
- Enzymatic processes in organic synthesis
- Carbohydrates in organic synthesis

The book is edited by J. Streith, H. Prinzbach and G. Schill and published for IUPAC by Blackwell Scientific Publications, Oxford, UK, 1985. ISBN 0 632 01441 5. 335 pp Price: £33

PAC Review

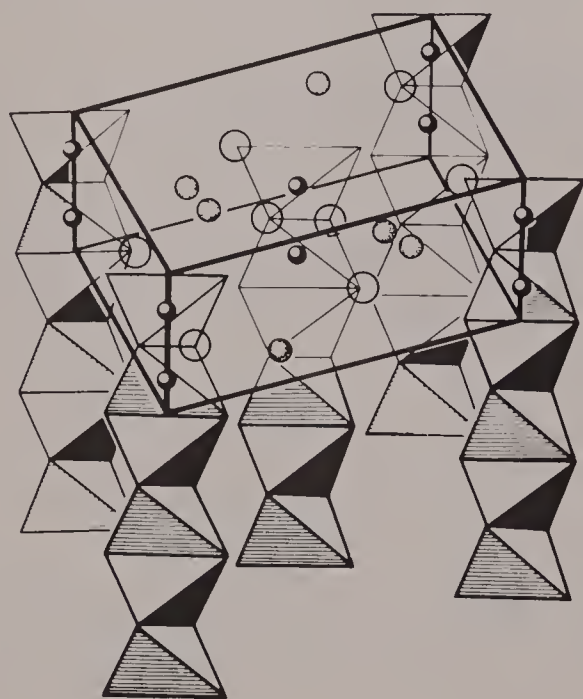
Pure and Applied Chemistry (fondly known in the IUPAC world as *PAC*) is the official journal of the Union. It publishes the main invited lectures of symposia sponsored by IUPAC; the recommendations of the Union's commissions on nomenclature, symbols and units and technical reports

on standardization, recommended procedures collaborative studies and data compilations. Summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports appearing in *PAC* are published in *CI* in the section 'Recent Reports'. In this section we take a brief look at the symposia and lectures published in recent issues of *PAC*.

Swarms

... of ions, not bees! Over the past three decades 'swarm experiments' have been developed to study ion-neutral-reactions occurring in natural and technical plasmas. These experiments have been applied to the investigation of the ion chemistry of the earth's ionosphere and to the detection of a variety of neutral molecules in interstellar clouds. The data collected for such experiments were reported and discussed in a paper on 'Basic ion reactions and kinetics in plasmas' by W. Lindinger (Austria). This paper was presented at the 7th International Symposium on Plasma Chemistry held at Eindhoven, Netherlands, 1–5 July 1985. The invited lectures at the Symposium were published in the September issue of *PAC*, Vol. 57, No. 9, 1985.

Chalcogenides



The figure above represents the structure of KFeS_2 . This is a ternary transition metal chalcogenide. These chalcogenides have the general formula $A_xM_yX_z$ where A is usually an alkali metal, M usually a transition metal and X usually sulphur or selenium. The framework structures and the characterization of their bonding by magnetic properties were described in a paper by Welf Bronger (FRG) presented at the 8th International

Conference on Solid Compounds of Transition Elements held in Vienna, Austria, 9–13 April 1985. Invited lectures at the Conference were published in the October issue of *PAC*, Vol. 57, No. 10, 1985.

Polymers, polymers and polymers

Invited lectures from three international symposia on polymers are published in the November issue of *PAC* (Vol. 57, No. 11). They include eight invited lectures presented at the International Symposium on Non-crystalline Order in Polymers held in Naples, Italy, 27–30 May 1985 and nine invited lectures presented at the 28th Microsymposium on Macromolecules "Polymer Composites" held in Prague, Czechoslovakia, 8–11 July 1985. This issue also contains two additional invited lectures presented at POLYMER 85 "International Symposium on Characterization and Analysis of Polymers" held in Melbourne, Australia, 11–14 February 1985. Thirteen invited lectures presented at this symposium were previously published in *PAC*, Vol. 57, No. 7 (1985).

Early diagnosis of hormone-dependent cancers

In the introduction to his paper on cobalt-mediated steroid synthesis, K. Peter C. Vollhardt (University of California, USA) states "The chemo-, regio-, and stereoselective construction of carbocycles is one of the major challenges of the synthetic organic chemists. Polycycle construction, particularly of natural products, is of particular interest in this regard, because many natural products and physiologically active compounds have structural features characterized by their presence. One such class of molecules which has held the traditional attention of synthetic organic chemists are the steroids. So many diverse and frequently ingenious strategies to synthesize their molecular framework exist that the steroids have become a veritable training ground on which to test the synthetic utility of novel synthetic methodology." Vollhardt's paper, which appeared in the December 1985 issue of *PAC* (Vol. 57, No. 12, pp. 1819–1826) reviews the current state-of-the-art of cobalt-mediated [2+2+2] cycloadditions in the total synthesis of the steroid nucleus.

In the same issue Gérard Jaouen and Anne Vessi  res (Ecole Nationale Sup  rieure de Chimie de Paris, France) report on hormonal steroids labelled with organometallic moieties which have been synthesized and tested as markers for hormone receptor assay (pp. 1865–1874). Their paper is entitled 'Transition metal carbonyl oestrogen receptor assay'. They conclude that 'the potential

application of this new receptor assay technique in the early diagnosis of hormone-dependent cancers appears feasible

These two papers were presented as invited lectures at the 3rd International Symposium on Organometallic Chemistry Directed Toward Organic Synthesis held in Kyoto, Japan, 11–15 July 1985. Twenty invited lectures from this symposium are published in the December 1985 issue of *PAC*.

Newsletters & Bulletins

IUPAC has strong links with a number of international organizations including United Agencies such as the World Health Organization (WHO), the Food and Agriculture Organization (FAO) and the United Nations Educational, Scientific and Cultural Organization (UNESCO). The Union is a member of the International Council of Scientific Unions (ICSU) and also has close relations with other international organizations known in the Union as Associated Organizations. Many of these organizations and their various bodies publish newsletters and bulletins. Since these are often of interest to our readers we publish, in this section, brief notes on their contents.

IUPAC Committee on the Teaching of Chemistry (CTC)

International Newsletter on Chemical Education, No. 23, June 1985. This issue concentrates on the problems facing teachers and students in tertiary institutions when the student is less well prepared than is normally expected for a chemistry course. There are papers entitled "The Challenges of Teaching to the Underprepared" by T. Y. Susskind (USA); "Some Approaches to the Problems Involved with Helping Underprepared Students" by A. E. Dominguez (Mexico); "Some Aspects of a New First Year Level Curriculum in Chemistry for Educationally-Disadvantaged Students" by J. D. Bradley (Republic of South Africa) and "Chemical Illiteracy of Entry Students to Tertiary Institutions" by J. Devenport (Australia).

European Photochemistry Association (EPA)

EPA Newsletter, No. 25, November 1985. This issue includes articles on "Photochemistry in Europe (Switzerland)" and "Environmental Photochemistry". There is also a report on the meeting of the IUPAC Commission on Photochemistry (III.3) at the Lyon General Assembly. The report is preceded by the Commission's "Glossary of Terms used in Photochemistry, Part 1" which was finalized at Lyon.

International Council of Scientific Unions (ICSU)

ICSU Newsletter No. 23, September 1985. This issue includes reports on various symposia, including the Bangalore Conference on Science and Technology and Future Human Needs, a Symposium on Drought in Africa, a meeting of the Regional Executive Committee of the African Biosciences Network (ABN) and the South–South and South–North Cooperation in Science Conference organized by the Third World Academy of Sciences (see *CI*, No. 6, p. 43, 1985). There are articles on the ICSU Press, the International Union of Radio Science, the International Atomic Energy Agency (IAEA), "Scientific Information and Documentation" and the report of the SCOPE–ENUWAR Steering Committee based on a two-year study on the Environmental Consequences of Nuclear War.

ICSU Scientific Committee on Problems of the Environment (SCOPE)

SCOPE Newsletter No. 24, July 1985. This issue deals with the SCOPE General Assembly held in Washington DC, USA, 9–13 September 1985. It also reports on the 4th workshop on Carbon and Minerals Transport in Major World Rivers held in Tjanjin, China, 13–17 May 1985.

SCOPE Newsletter No. 25, December 1985. The resolutions of the VIth SCOPE General Assembly are partly reproduced in this issue. The issue also includes a text drawn from the Foreword of a report prepared by the ENUWAR Steering Committee. ENUWAR is a SCOPE study of the Environmental Consequences of Nuclear War (see *CI*, No. 6, pp. 31–35, 1985).

ICSU Committee on Data for Science and Technology (CODATA)

CODATA Newsletter No. 33, July 1985. This issue reports on the Working Group on Multisatellite Thematic Mapping initiated in 1982 and its operation in Tanzania to integrate geologic, geographic and climatic data for multidisciplinary application, especially land-use planning and mineral exploration. Other topics included in this issue are the National Space Science Data Center (NSSDC) in the USA, and an article on the International Union of Microbiological Societies (IUMS)

CODATA Newsletter No. 34, October 1985. This issue contains details of the 10th International CODATA Conference to be held in Ottawa, Canada, 14–17 July 1986. There is also an announcement by CODATA's Thermodynamic Tables Task Group

about publications, plans and needs. The first of two volumes entitled "CODATA Key Values for Thermodynamics" which gives definitive values for thermophysical and thermochemical properties for 150 substances (including 53 elements and — typically — their aqueous ions and an oxide and halide) appears this year. The second volume of "CODATA Thermodynamic Tables" is also being published this year. This issue also contains details of a CODATA-sponsored workshop in Canada, 19–23 May this year on Internationally Compatible Environmental Data.

CODATA Bulletin, No. 57, October 1985. This issue is Chapter 12 of the *CODATA Directory of Data Sources for Science & Technology*. The directory is intended to serve as a source of information on where to find reliable data on a given subject. Each chapter contains the following sections; (a) International Data Programs; (b) National Data Programs; (c) Data Centers; (d) Major Publication Series; (e) Other Data Sources; (f) Bibliographies (g) Online Databases. Chapter 12 is devoted to data on nutrition.

ICSU Committee on Space Research (COSPAR)

COSPAR Information Bulletin, No. 103, August 1985. COSPAR was established by ICSU in October 1985 to continue the programmes of rocket and satellite research successfully undertaken during the International Geophysical Year (1957–58). The COSPAR Information Bulletin is published three times a year. This issue contains information on past and future meetings, news from national and international institutions and organizations, news from COSPAR bodies, a survey of satellites and space probes and sections on publications and acronyms.

COSPAR Information Bulletin, No. 104, December 1985. More on COSPAR meetings and more news from international institutions and organizations including an item entitled "Giotto on its way to Halley's Comet". Giotto is a European Space Agency (ESA) interplanetary space probe.

COSPAR Directory, June 1985. This contains the updated membership of COSPAR bodies.

ICSU Press

The ICSU Press Newsletter, No. 3, August 1985. This third issue is based largely on the annual report of the ICSU Press to the ICSU General Committee. It sets out the aims and purposes of the ICSU Press; presents an updated summary of new ICSU publications; gives an account of its activities from 1983 to 1985; gives details of its publication

projects and lists co-operating ICSU "family members" — IUPAC is the first to be mentioned.

ICSU Committee on Teaching of Science (CTS)

International Newsletter on Science Technician Training, No. 5, September 1985. Papers in this issue include "Role of the Colombo Plan Staff College in Technician Education in Asia and the Pacific" by Y. Saran and S. A. Balu (India); "Technical Education in Kenya" by E. Rugumayo and "University of Alexandria Research Centre. Collaboration with Bristol Polytechnic in in-service short courses in Scientific Instrumentation" by M. El-Gamal (Arab Republic of Egypt) and G. Currell (UK).

International Programme on Chemical Safety (IPCS)

Sentinel: Health and Environmental International, Vol. 2, No. 1, August 1985. This contains a report on the United Nations Environment Programme/International Register of Potentially Toxic Chemicals (UNEP/IRPTC) world notification scheme for banned and severely restricted chemicals. There are also articles entitled "WHO to Monitor Rural Cooking Fires Hazard (Up to 400 million at risk from biomass fuel smoke)" and "Food Contamination: Concern Grows". The headlines of **Vol. 2, No. 2, November 1985** are "Poisoned? Help is at the end of a telephone" The help is available at Poison Control Centres (PCCs) which have been established in over 33 countries. Other articles in this issue include "The Key to Safe Food for Man" and "IRPTC lends helping hand to harassed waste managers (Toxic waste disposal: a world problem)".

International Union of Food Science and Technology (IUFoST)

IUFoST Newsletter, No. 12, June, 1985. This contains a message from the President, details of IUFOST symposia, news from adhering bodies and details of new food journals.

International Federation of Clinical Chemistry (IFCC)

IFCC News, No. 40, 1985/2. This issue includes an article entitled "Post-graduate education and training in clinical chemistry" and a report on "ISEs, pH and blood gases". ISE means Ion-Selective Electrode. The background and terms of reference of an IFCC expert panel on apolipoproteins is also detailed in this issue.

Environment Liaison Centre (ELC)

Ecoforum, No. 2, April 1985. Are "Women" a priority for NGOs in the North? This is the headline in this issue of **Ecoforum**. An NGO, by the way, is a Non-Governmental Organization. The issue is devoted to women and includes articles entitled "Women and the Environment"; "Women, Male Migration and Environment"; "Why Appropriate Technology Projects for Women Fail?" and "Involvement of Women Crucial in Energy Planning". **No. 3, June 1985** is concerned with energy. There are articles on "Which energy crisis is over", "Cookstoves if necessary . . . But not necessarily cookstoves" "Rural Electrification" and "Integrated Renewable Energy Systems". "Scientists cannot ignore farmers" is one of the front page headlines of **No. 4, August 1985**. Other articles include "The business of food in Africa"; "Getting off the pesticide Treadmill"; "Increasing Food Production by Reducing Wastage" and "Saving the Hillside Top Soil".

International Organization for Standardization (ISO)

ISO Bulletin No. 9, September 1985. This contains an article entitled "Fluid Power, Muscle Power" concerning fluid power systems. **Nos 10/11, October/November 1985** report on the ISO General Assembly held in Tokyo, Japan, 9–13 September 1985. There is also an article on Ceramic Tiles. **No. 12, December 1985** features photography.

International Astronomical Union (IAU)

IAU Information Bulletin 54, September 1985. Much of this issue deals with the IAU General Assembly held in Delhi, India, 19–28 November 1985. There are also sections on forthcoming and past conferences, publications and news from the commissions of IAU.

International Association for Cereal Chemistry (ICC)

ICC Newsletter, No 5, September 1985. This newsletter includes brief reports on and an ICC Working Group on Maize and an ICC Study Group on "Nutritional Aspects of Cereal Foods". There are details of Cereals '88 — an International Cereal and Bread Congress.

United Nations Educational Scientific and Cultural Organization (UNESCO)

Chemistry of Natural Products. Vol. 9, No. 1, January–May 1985. This newsletter was formerly known as *Chemistry in Asia*. It is the newsletter of UNESCO's Regional Network for the Chemistry of Natural Products in Southeast Asia. This issue includes a review of the activities of the network during its first ten-year period, 1975–84 (see *CI*, No. 4, p. 4, 1985). There are also details of future meetings — including IUPAC sponsored symposium — to be held in Southeast Asia.

Other Publications

Opportunities in Chemistry

This report presents the results of a survey undertaken in the USA by a National Research Council Committee. Members on the committee included representatives of the academic, industrial, and governmental research sectors, the geographic areas, and the major subdisciplines. The chairman of the committee was Prof. George C. Pimentel of the University of California, Berkeley. The Pimentel report makes clear that although chemistry still performs the role of central science in meeting society's needs the science and practice of chemistry have undergone enormous changes in the past 20 years. The report represents a consensus view of the entire chemical community on the opportunities currently found in the field.

The book includes a section on "Control of chemical reactions" which contains chapters on

new processes, energy and new products and materials. A section on "Dealing with molecular complexity" includes chapters on food, health and biotechnologies. Another section on "Chemistry and national well-being" contains chapters on environment and economic competitiveness. All three of these sections have chapters on instrumentation. Two other chapters are devoted to "Manpower and education" and "Resources for basic research in the chemical sciences".

The full report is available from National Academy Press, 2101 Constitution Ave., N.W., Washington, D.C. 20418, USA. 352 pp. Paperback (ISBN 0 309 03594 5), price US-\$18.50. Hardcover (ISBN 0 309 03633 X), price US-\$28.50.

Those acronyms again

Did you know that LUMO is the acronym for Lowest Unoccupied Molecular Orbital and that TEA is not a beverage but Triethanolamine. CARS is Coherent anti-Stokes Raman Spectroscopy and BO the Born–Oppenheimer approximation. These are just some of the 'Common Chemical Acronyms' listed in a paper by B. C. Sharma and S. S. Saksena (New Delhi, India) entitled "Handling Chemical Acronyms". Unfortunately the authors are under the misapprehension that CI stands for Configuration Interaction/Chemical Ionization! The paper is published in *Chemistry Education* Vol. 1, No. 4, pp. 47–51 (1985). This issue marks the completion of the first year of publication of this quarterly journal. The journal is sponsored by the University Grants Commission (New Delhi) and published by Macmillan India Ltd. It is edited by Prof. K. V. Sane.

The Role of Data in Scientific Progress

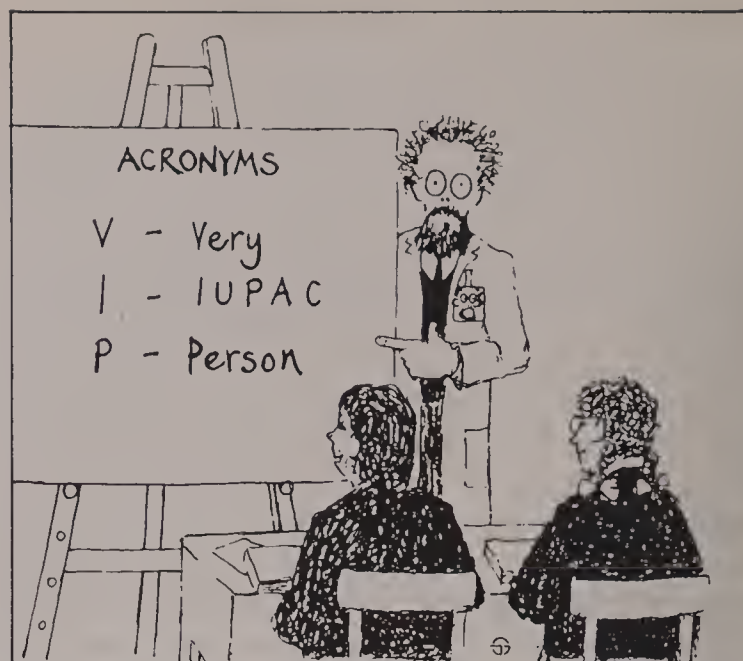
The 109 papers include in this volume have been selected from the full list of presentations at the 9th International CODATA Conference held in Jerusalem, 24–28 June 1984. The two main themes of the conference were: (a) new computer-based methods for storing, manipulating and disseminating scientific and technical data, and (b) the use of such computerized data files to give new scientific insights.

The book is edited by Phyllis S. Glaeser and was published in 1985 for CODATA by Elsevier Science Publishers B.V. (North-Holland). ISBN 0 444 87703 7. 549 pp.

Safe use of pesticides

The *Safe use of pesticides* is the 9th report of the WHO Expert Committee on Vector Biology and Control. The report contains chapters on "Developments in vector control: human safety aspects"; "Review of new data on insecticides for control of vectors"; "Review of selected compounds for control of rodents and molluscs of public health importance"; "Protection of people who use pesticides"; "Prevention and treatment of poisoning"; and a "Summary of recommendations".

The report is part of the *WHO Technical Report Series* which makes available the findings of various international groups of experts that provide WHO with the latest scientific and technical



advice on a broad range of medical and public health subjects. An annual subscription to this series, comprising 15 to 20 such reports costs Sw.fr.80.—.

Summaries of these reports and of all other WHO publications are included regularly in the *WHO Chronicle*, a periodical review of the Organization's activities, published in Arabic, Chinese, English, French, Russian, and Spanish: annual subscription Sw.fr.20.—.

International Tables for Crystallography

This brief *Teaching Edition of Volume A of Space-Group Symmetry* consists of 24 selected space-group descriptions and those basic text sections of Volume A which are necessary for the understanding of the space-group example (Sections 1 and 2), for the determination of space groups (Section 3), and for the transformations between the various space-group descriptions (Section 5).

The purpose of the *Teaching Edition* is threefold:

- To provide a tool for researchers and students to familiarize themselves with the use of the space-group tables in Volume A.
- It is designed for use in classroom teaching.
- It may serve as a laboratory handbook because the 24 examples include most of the frequently occurring space groups, for both organic and inorganic crystals.

The book is edited by Theo Hahn and published for The International Union of Crystallography by D. Reidel Publishing Company, Dordrecht, Holland (1985). vii + 119 pp. ISBN 90-277-1964-0. Price Dfl.27.50/US-\$8.50/£7.60.

Conferences

Prof. Vladimir Prelog

The Association of Chemists and Technologists of Croatia together with the Croatian Chemical Society have organized a scientific meeting dedicated to Prof. Vladimir Prelog on the occasion of his 80th birthday. The meeting will be held in Zagreb, Yugoslavia 3–4 June 1986. The official language of the meeting will be English. For further information please contact: Dr Miljenko Dumić, Savez Kemičara i tehnologa Hrvatske, Berislavićeva 6/1, 41000 Zagreb, Yugoslavia.

Polymer supported reactions

The 3rd International Conference on Polymer Supported Reactions in Organic Chemistry will be held in Jerusalem, Israel 6–11 July 1986. It will include main lectures by invited speakers, oral contributions, poster sessions and panel discussions covering the following topics: (a) Synthesis, properties and applications of polymer supported reagents with emphasis on the aspects of polymer structure, reactivity and comparing organic and inorganic matrices; (b) Synthesis of polymeric reagents and their structural analysis; (c) The role of polymeric reagents in organic syntheses; (d) Catalysis with polymer supported organo-metallics and enantiomeric resolution with chiral polymeric reagents; (e) Automated syntheses, photographic and biotechnological applications of polymer supported reagents and diagnostics; (f) Structure and application of organized systems, bilayer membranes, immobilized enzymes and cells. For further information write to: A. Warshawsky, Department of Chemistry, The Weizmann Institute of Science, Rehovot 76100, Israel.

Mechanisms of reactions in solution

The 4th International Conference on the Mechanisms of Reactions in Solution will take place at the University of Kent, Canterbury, UK, 7–11 July 1986.

The aim of the Conference, like that of the previous three Conferences in 1970, 1979 and 1982, is to bring together workers in all fields of research concerned with the mechanisms of reactions in solution. There will be seven plenary lectures and eight section plenary lectures, and four parallel

streams of contributed papers, concerned respectively with:

- Organic Reactions
- Inorganic Reactions
- Reactions of Biological Importance
- Physical Aspects of Reaction Mechanisms.

All correspondence relating to the Conference should be addressed to: Dr John F. Gibson, The Royal Society of Chemistry, Burlington House, London W1V 0BN, England.

10th International CODATA Conference

This Conference will be held in Ottawa, Canada, 14–17 July 1986. The major themes of the conference are:

- Computerized databases — technology and management
- Computer techniques in data and systems analysis
- Numerical information systems in materials science, technology and industry
- Numerical data processing and dissemination in geosciences
- Data needs in industry

For further information please contact: Huguette Lacoste, Executive Secretary, CODATA '86, National Research Council Canada, Ottawa, Canada, K1A 0R6.

Chromatography

The 16th International Symposium on Chromatography, organized by GAMS (Groupement pour l'Avancement des Methodes Spectroscopiques et physico-chimiques d'analyse), will be held in Paris, France 21–26 September 1986. The programme will comprise plenary lectures, oral presentations and poster sessions dealing with all aspects of chromatography and related techniques. Lectures may be held in English, German or French, though English is recommended for the facilitation of communication and exchanges. An exhibition of chromatographic and ancillary equipment will be held at the Symposium site. All correspondence concerning the Symposium should be directed to: GAMS, 88bd Malesherbes, 75008 Paris, France.

International Congress of Toxicology

The International Union of Toxicology (IUTOX) will hold its 4th International Congress in Tokyo, Japan, 21–25 July 1986. The scientific programme will comprise the Deichmann Lecture, given by Dr Takashi Sugimara (Japan), 7 Symposia and Free Communications. The Symposia will be on the following topics: Advances in research on chemicals carcinogenesis; Evaluation of multifaceted toxicity of bulk chemicals — Trichlorethylene and tetrachloroethylene; The influence of nutritional factors on chemical toxicity; Mycotoxins as a tool for toxicological study; Pharmacokinetics in clinical toxicology; Reproductive and developmental toxicology — identifying hazards and estimating risks and Skin — as a target organ and route of exposure. The working language will be English. For more details please write to: The Secretariat, IV International Congress of Toxicology, Hongo PO Box 45, Tokyo 113, Japan.

Centenary of the Discovery of Fluorine

This Symposium will be held at "La Maison de la Chimie", Paris, France, 25–29 August 1986 to celebrate the discovery of fluorine in 1886. The official languages are French and English. Abstracts, posters, or oral communications, can be in either language although the plenary lectures and other invited lectures will be in English. Contributed papers will deal with all aspects of fluorine chemistry including: organic, inorganic, pharmaceutical, analytical, and theoretical fluorine chemistry, as well as biochemistry, and electrochemistry of fluorine containing compounds. For further information please contact: Roland Bougon, Secretariat CDF, DESICP/DIR/A, C.E.N.—SACLAY, 91191 Gif-sur-Yvette, Cedex, France.

Scientific Conference in Iraq

The 4th Scientific Conference of the Scientific Research Council (Iraq) will be held in Baghdad, Iraq, 23–28 October 1986. The main topics will be: agricultural research, petrochemical research, solar energy/new and renewable sources of energy, biological science, space and astronomy, electrical electronics/computer science, and information systems/scientific documentation. The official languages will be Arabic and English. For further information contact: The Secretary, The Organizing Committee of the Fourth Scientific Conference, Scientific Research Council, Jadiriya PO Box 2202, Baghdad, Iraq.

Technician Education and Training

An international symposium on technician education and training organized by the National Council for Educational Awards, Ireland and UNESCO will be held in Dublin, Ireland 18–22 August 1986. The themes of the symposium are

- The role of the technician in the developing countries.
- The role of the technician in industrialised economics
- Trends in technician education and training. Continuing education programmes for technicians.
- The challenge of technological advances — contemporary problems for educators and employers.
- The international exchange of educational training expertise to promote industrial development and technology transfer.

The symposium will be held at Trinity College, Dublin, which is one of the oldest university colleges in the world. For further information and application forms please contact: R. J. A. Bradley, Symposium Secretary, National Council for Education Awards, 26 Mountjoy Square, Dublin 1, Ireland.

Microchemical Techniques

The Association of Official Analytical Chemists (AOAC) will hold its 10th International Symposium on MICROCHEMICAL TECHNIQUES at the University of Antwerp, Belgium, 25–29 August 1986. There will be two parallel sessions covering: (i) trace analysis and microchemical techniques and (ii) microbeam analysis and surface analysis. For further information contact: Dr R. Dewolfs, University of Antwerp (UIA), Department of Chemistry, Universiteitsplein 1, B-2610, Antwerp-Wilrijk, Belgium.

Infectious and parasitic diseases

The 9th International Congress of Infectious and Parasitic Diseases will be held in München, FRG, 20–26 July 1986. The main topics of the congress are viral infections, bacterial infections, mycotic infections, parasitic infections, immunology and antibacterial chemotherapy. Further details from IXth International Congress of Infectious and Parasitic Diseases, c/o Abteilung für Infektions-und Tropenmedizin der Universität, Leopoldstrasse 5, D-8000 München 40, FRG.

IUPAC-Sponsored Conferences

International Symposium on Biochemical and Cellular Indices of Human Toxicity in Occupational and Environmental Medicine *Milan, Italy, 19–22 May 1986*



Main Court of the University of Milan.

This symposium, which celebrates the 80th anniversary of the International Commission on Occupational Health (ICOH) will be held in the Main Auditorium of the University of Milan. This is located in the Centre of the City. The scientific programme consists of six sessions:

- Validation of methods used for human biological monitoring
- Biochemical indices of liver toxicity: enzyme induction, lipid peroxidation and other indices relevant to liver function changes
- Biochemical indices of liver toxicity: porphyrin metabolism
- Biochemical and cellular indices of renal changes induced by exogenous chemicals
- Biological indices for assessment of human genotoxicity induced by exogenous chemicals
- Biochemical indices of nervous tissue toxicity and exposure to neurotoxicants

Unsolicited contributions will be presented as posters.

The official language of the symposium is English. Simultaneous translation from English to Italian and vice versa will be provided. The symposium proceedings will be published before the end of 1986 and include all invited lectures and solicited contributions together with a selection of unsolicited papers.

Registration fees after 31 March 1986 are Lit. 500.000 for a participant and Lit. 200.00 for an accompanying person. Hotel accommodation at various prices is available in the centre of Milan.

Apart from being an important trade centre,

Milan is known for its historical and cultural attractions and is also the centre of Italian fashion. Participants will be offered a varied social programme, including a city sightseeing tour, a concert, a reception, visits to museums and places of architectural interest, plus opportunities for shopping. For those wishing to prolong their stay in Italy, 2–3 day tours to Venice, Florence or Rome will be arranged. The climate in Milan at this time of the year is very agreeable. It is warm but not too hot although the evenings may be cool.

7th International Zeolite Conference *Tokyo, Japan, 17–22 August 1986*

This Conference is being organized by the International Zeolite Association and the Chemical Society of Japan.

The scientific programme will consist of oral presentations, both invited and submitted papers, and poster sessions covering science and technology related to zeolite and molecular sieve, including: mineralogy, geology, structure, synthesis, ion-exchange and modification, sorption, catalysis and technical applications including agricultural uses.

The official language of the Conference will be English.

Excursions to Nikko or Hakone, and a post-conference tour of natural zeolite deposits in the Tohoku district will be available. Social events, including a reception and banquet, as well as general daytime programmes for accompanying persons are planned.

CHEMRAWN V: Current and Future Contributions of Chemistry to Health — The New Frontiers

CHEMRAWN V will be held from 22–26 September 1986, in Heidelberg, Federal Republic of Germany. It is being organized by Gesellschaft Deutscher Chemiker. CHEMRAWN stands for ‘CHEMical Research Applied to World Needs’ and is the title of a series of IUPAC Conferences. The aim of CHEMRAWN V is to create recommendations for establishing advanced drugs and therapies. Prominent scientists will report on the state of the art, new frontiers and needs for the future in drug and medical research. The conference is directed at scientists from university and industry, opinion leaders in science and health politics from national and international health institutions, and the media.



Two views of Heidelberg.



Dr W. Fritsche, Chairman of
CHEMRAWN V Organizing Committee.



The scientific programme of the conference is divided into four sections (see box). In addition to the main lectures there will be panel discussions and poster sessions.

The official language of the conference will be English.

Excursions to institutions of scientific research are being organized. These included visits to Deutsches Krebsforschungszentrum, Max-Planck-Institut für Medizinische Forschung, the European Laboratory for Molecular Biology and some industrial firms. There will also be a social programme. Details of this will be announced in the third circular which will be published in May.

Heidelberg is the embodiment of German romantic-

ism. The picturesque city, steeped in rich tradition and full of charm, nestles between forest covered hills in the lush wine growing region of the Neckar Valley. It is famous for its ancient university, magnificent castle and many other beautiful and historic buildings. Today, it is one of Europe's most attractive tourist destinations as well as a centre of learning, research, culture and commerce.

Further information about CHEMRAWN V can be obtained from:

Gesellschaft Deutscher Chemiker,
Abteilung Tagungen,
PO Box 90 04 40,
D-6000 Frankfurt am Main 90,
Federal Republic of Germany.

1. **Progress in analytical chemistry: a stimulant for diagnosis and therapy.**

- Development of clinical chemistry: past, present, future (J. Büttner, FRG)
- Progress in diabetes management by selftesting with dry chemistry analysis (M. Berger, FRG)
- Modern patient management by drug concentration monitoring (W. E. Evans, USA)
- New approach using immuno diagnostics for early diagnosis and immuno-suppressive drugs in the treatment of juvenile type diabetes (K. Fcderlin, FRG)
- Management of thyroid diseases using immuno diagnostic methods (R. D. Hesch, FRG)
- Rapid diagnosis of infectious diseases using nucleic acid technology (D. Dichman, USA)

2. **Antibacterial and antiviral chemotherapy**

- Clinical experience and future needs in classical chemotherapy (G. G. Jackson, USA)
- New concepts for biologically active microbial compounds (V. Braun, FRG)
- State of the art and gaps in antimycotic therapy (H. B. Levine, USA)

- Recent trends and developments in antiviral chemotherapy (E. De Clercq, Belgium)

3. **Parasitic infections**

- Available anthelmintics and future needs (A. Davis, Switzerland)
- Available antiprotozoal drugs and future needs (W. Peters, UK)
- Future concepts for the treatment of parasitic diseases (G. J. Nossal, Australia)

4. **The demographic development of population changing incidence and distribution of diseases — a challenge to industrial civilization**

4.1 **Cardiovascular diseases**

- Pharmacology and therapeutic potential of calciumantagonists (A. Fleckenstein, FRG)
- New approaches to calcium modulating based on receptor pharmacology (D. J. Triggle, USA)
- Future perspective in the development of antiarrhythmic drugs (E. M. Vaughan-Williams, Oxford, UK)
- Drugs of the future for the treatment of cardiac insufficiency, a life threatening disease (B. Wetzel, FRG)
- Arterial and venous thrombosis — new approaches in drug therapy (M. Verstraete, Belgium)

4.2 **Metabolic disorders**

- Low density lipoproteins and atherogenesis: implications for modification through alterations in diet and new drug designs (I. M. Dietschy, USA)
- Lipid metabolism and atherosclerosis: possibilities of controlling risk factors by drugs or diet (G. Assmann, FRG)
- The insulin receptor, a rationale for the development of drugs (A. Ullrich, USA)

4.3 **Neuropsychiatric disorders**

- Senile dementia: outlook for the future (D. H. Hinzen, FRG)
- Pathological and biochemical aspects of Alzheimer's disease (H. M. Wisniewski, USA)
- Parkinson's disease: biological and pharmacological aspects (O. Hornykiewicz, Austria)

4.4 **Cancer — do we make progress in research and clinical treatment?**

- Chemotherapy of cancer, a classical concept? (H. J. Hohorst, FRG)
- DNA — Tumourviruses and oncogenes (H. zur Hausen, FRG)
- RNA — Tumourviruses and oncogenes (P. Vogt, USA)
- Therapy of cancer with monoclonal antibodies (R. A. Reisfeld, USA)

8th IUPAC Conference on Physical Organic Chemistry Tokyo, Japan, 24–29 August 1986

The scientific sessions of this Conference will take place in the Toshi Center Hall which is located in central Tokyo near the Imperial Palace.

The Conference programme will emphasize recent developments in the chemistry and physics of molecular interactions and reactive intermediates in organic chemical and biological systems. The following plenary lectures are planned:

Recent Studies of Reactive Intermediates (J. A. Berson, USA)

Some Studies on the Tautomerism of Heterocyclic Compounds (B. Capon, Hong Kong)

Sigma-Pi Interactions — Experimental Evidence and its Consequences for the Reactivity of Organic Compounds (R. Gleiter, FRG)

Design of Organic Molecules and Molecular Assemblies with Electron Spin Alignment (H. Iwamura, Japan)

Ions, across the Gas Phase and into Solution (P. Kebarle, Canada)

Stereoelectronic Effects on Bond Length and Reactivity (A. J. Kirby, UK)
 Bridgehead Double Bonds (J. Michl, USA)
 Multilayered Cyclophanes — Strained Structures and Novel Reactions (S. Misumi, Japan)
 Structure and Reaction Controlled by Strong Sigma/pi Interaction (H. Sakurai, Japan)
 A Systematic Survey of the Effects of Substituents on the Structures and Energies of the Principal Organic Reaction Intermediates (P. von R. Schleyer, FRG)
 Conformation, Structure and Mechanism: The Development of Models to Understand Chemical Properties (J. I. Seeman, USA)
 Organic Reactions in the Solid State (M. Simonetta, Italy)

Nucleophilicity of Nucleofugic Anions (N. S. Zefirov, USSR)

The Conference language will be English; no translation facilities will be available.

Tokyo is well provided with accommodation for visitors. The registration fee of the Conference is ¥ 35 000 for active participants if sent before 30 June 1986 or ¥ 40 000 after this date. For accompanying persons it is ¥ 10 000.

The Conference occurs in the transitional period between summer to autumn when the climate is less humid and more tolerable than in midsummer. Visitors can make day trips to Nikko (Toshogu Shrine and scenic view of Kegon Fall and Chuzenji Lake), Hakone (Spa and beautiful view of Mt Fuji) and Kamakura (ancient capital of Shogun era).

International Conference on Chemical Thermodynamics *Lisbon, Portugal, 14–18 July 1986*

The scientific programme of this Conference will consist of plenary lectures, contributed papers and short communications. There will be no poster sessions. The plenary lectures are:

- Fluids at high pressures and temperatures (E. U. Franck, FRG)
- Calorimetry in the study of physical adsorption (J. A. Morrison, Canada)
- Thermodynamic properties of ionic fluids over wide ranges of temperature (K. S. Pitzer, USA)
- Statistical thermodynamics of small systems and interfaces (J. S. Rowlinson, UK)

The Conference is organized in nine major sections or symposia some of which will function simultaneously:

1. Thermodynamics of mixtures
2. Thermodynamics of interfaces
3. Theoretical and simulation studies of solutions

4. Supercritical fluids — theory and applications
5. Energetics of chemical bonds
6. Planetary thermodynamics
7. Modern techniques
8. Biothermodynamics
9. General

The official language of the Conference will be English.

The registration fee is US-\$100. This is waived for accompanying persons. The fee covers participation in all scientific meetings, a book of abstracts and other documentation, buffet reception and a dinner given by the Chancellors of the three Lisbon universities.

The Calouste Gulbenkian Foundation, situated in central Lisbon, is a large complex built on beautifully landscaped gardens. It boasts excellent conference facilities, library, snack bars and restaurant and two museums, one housing the famous Gulbenkian Art Collection and the other specializing in modern art.



The Calouste Gulbenkian Foundation in Lisbon, venue of IUPAC sponsored Symposia on Chemical Thermodynamics and Photochemistry this summer.

International Conference on Bio- and Toxicokinetics of Metals *Kitakyushu, Japan, 27–31 July*

The VIth UOEH International Symposium and IIIrd COMTOX on Bio- and Toxicokinetics of Metals will be held together as a satellite symposium of the IVth International Congress of Toxicology. UOEH is the University of Occupational and Environmental Health, Kitakyushu, Japan. It is the venue of the symposium. COMTOX is the International Conference on Clinical Chemistry and Chemical Toxicology.

The scientific programme of the symposium will cover the following topics:

1. Metal dynamics in various diseases (Aluminium osteodystrophy and encephalopathy in hemodialysis, zinc and other trace elements in chronic renal failure, etc.)
2. Beneficial and adverse effects in medical treatment (Gold nephropathy, platinum renal

injury, etc.)

3. Metals and nutritional factors
4. Carcinogenicity and mutagenicity
5. Effects of metals on aging and other factors
6. Difference of toxicological effects of chemical forms
7. Biological interactions of metals
8. Effects of enzyme action
9. Environmental and biological monitoring
10. Recent progress in analyses
11. Epidemiological approach

The symposium language is English. The registration fee after 31 March 1986 25000 Japanese Yen. There is also a reception fee of 6000 Japanese Yen. A social programme for symposium participants and accompanying persons is planned.

11th International Symposium on Photochemistry *Lisbon, Portugal, 27 July–1 August 1986*

This symposium will be held at the Calouste Gulbenkian Foundation in Lisbon. Plenary lectures will be given by invited speakers on the following topics:

- Laser Flash Photolysis (G. Porter, UK)
- Theoretical Aspects on Photochemistry (J. Jortner, Israel)
- Organic Photochemistry (N. J. Turro, USA)
- Radiationless Transitions (S. J. Formosinho, Portugal)
- Photochemistry of Coordination Compounds (T. J. Meyer, USA)
- Photoelectrochemistry (A. Heller, USA)
- Photopolymerization (H. Hasegawa, Japan)
- Photochemistry of Surfaces (D. Oelkrug, FRG)

There will also be ten invited lectures in addition to these plenary lectures. Four panel sessions will

cover research topics on fundamental and applied aspects of photochemistry. Contributed papers will be accepted for poster presentation and 36 will be presented orally. Abstracts should be submitted by 30 April 1986. These will be reproduced photographically and edited in a collective volume.

The Conference language will be English. No translation facilities will be available.

Accommodation will be provided in hotels and residences in Lisbon near the Conference site. The registration fees are US-\$125 for active participants, US-\$90 for university students and US-\$80 for accompanying persons.

Lisbon is a historical city with many points of interest such as museums and ready access to beaches. In July the climate is dry and temperatures in the range 25–32°C.

13th International Carbohydrate Symposium *New York, USA, 10–16 August 1986*

The scientific programme of this symposium will cover all aspects of the chemistry, biochemistry, and utilization of carbohydrates. The programme will include plenary lectures, invited lectures, short oral presentations, and poster presentations. The following four main topic headings will be used to group symposium contributions:

- Synthesis (monosaccharides, oligosaccharides, nucleosides/nucleotides, antibiotics, carbohydrates as chiral synthons).
- Determination of structure, conformations, instrumental methods (low-molecular-weight carbohydrates, polysaccharides, glycoconjugates, analytical procedures).



- Biochemistry (glycoproteins, glycolipids, glycosaminoglycans, proteoglycans, polysaccharides, enzymes, enzyme-deficiency diseases, lectins, biosynthesis).
- Applied and industrial (foods, nutrition, forest products, biotechnology).

The symposium will include the following plenary lectures:

Recombinant DNA approaches to carbohydrate biochemistry (W. Robbins, USA)

The three-dimensional structures of N-linked oligosaccharides (J. P. Carver, Canada)

Synthetic ventures in pseudo-sugar chemistry (T. Suami, Japan)

Basic monosaccharide derivatives: Tools for mapping the active site of glycohydrolases and for studies in glycoprotein biosynthesis (G. Legler, FRG)

Topics in carbohydrate stereochemistry (S. J. Angyal, Australia)

Immobilized enzymes in preparative carbohydrate chemistry (S. David, France)

Glycolipids as receptors on animal cells for bacteria, bacterial toxins and viruses (K-A. Karlsson, Sweden)

C₆ ulose solvents (H. Hergert, USA)

English will be the official language of the symposium. Abstracts of all contributions will be published in an abstract book which will be distributed to all registrants on site. The plenary lectures will be published shortly after the symposium.

The symposium will be held on the campus of Cornell University, Ithaca, New York. Cornell University is located in an idyllic, rural setting. Ithaca is on Cayuga Lake in the Finger Lakes region, about 250 miles (400 km) northwest of New York City, about 400 miles (650 km) southwest of Montreal, and about 60 miles (100 km) southwest of Syracuse, New York.

Social events highlighting the beauty and culture of the area will be available to participants and

accompanying members. Included will be excursions to museums, scenic areas, and historical sites; opportunities to experience local cuisine; shopping trips; and musical, dance and theatrical entertainment. Pre- and post-symposium tours to New York City, Niagara Falls, the Thousand Islands, the Hudson River Valley, and other areas in the Northeastern United States will be available.

Reduced conferences fees for Affiliates

Organizers of the following conferences have agreed to a 10 per cent reduction in Conference fees for Affiliates:

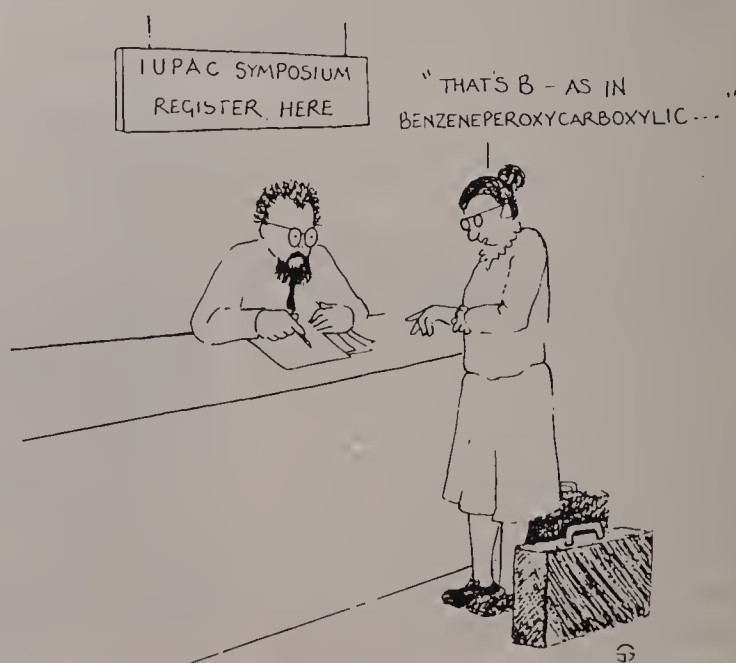
2nd International Symposium on Biological Reference Materials (Münich, FRG, 24–25 April 1986)

International Symposium on Biochemical and Cellular Indices of Human Toxicity in Occupational and Environmental Medicine (Milan, Italy, 19–22 May 1986)

International Conference on Bio- and Toxicokinetics of Metals (III COMTOX) (Kitakyushu, Japan, 27–31 July 1986)

8th International Symposium on Solute-Solute-Solvent Interactions (Regensburg, FRG, 9–14 August 1986)

10th International Conference on Non-Aqueous Solutions (Leuven, Belgium, 17–21 August 1986)



10th International Conference on Phosphorus Chemistry

Bonn, FRG, 31 August–6 September 1986.

The scientific programme of this conference will consist of three simultaneous sessions on different topics:

Section A: Reactivity, Mechanisms, Geometry, Coordination and Physical Methods in Phosphorus Chemistry

Section B: Phosphorus in Particular Coordination and Bonding

Section C: Biochemistry of Phosphorus and New Compounds of Commercial Interest

The official language of the Conference will be English.

The registration fee is tentatively set at DM 350 for participants and DM 120 for accompanying

persons. Bonn is easy to reach by train or car. The nearest international airports are Cologne/Bonn, Düsseldorf and Frankfurt.

There will be an opportunity for interested groups or companies to hold their own exhibitions. There will also be tours and events arranged for accompanying persons including a concert, a boat trip along the Rhine and a banquet.

Bonn, capital of the Federal Republic of Germany, gateway to the Rhine Valley, offers a wide choice of accommodation. A limited number of participants can make use of the reasonably priced bed and breakfast accommodation in dormitories at the Conference centre. Lunch will be served in the student restaurant.

Conference Calendar

Conference circulars and registration forms are available from the names and addresses shown in brackets.

1986

Biological Reference Materials

24–25 April 2nd International Symposium on Biological Reference Materials. Neuherberg, Munich, FRG.

(Dr Markus Stoeppler, Institut f. Angewandte Physikalische Chemie, Kernforschungsanlage Jülich, Postfach 1913, D-5170 Jülich 1, Federal Republic of Germany.)

Human Toxicity

19–22 May. International Symposium on Biochemical and Cellular Indices of Human Toxicity in Occupational and Environmental Medicine. Milan, Italy.

(International Symposium, Biochemical and Cellular Indices of Human Toxicity in Occupational and Environmental Medicine, AISC-Organizing Secretariat, Viale Parioli 2, 00197 Roma, Italy.)

Organic Chemistry in Technological Perspective

1–6 June. International Symposium on Organic Chemistry in Technological Perspective. Jerusalem, Israel.

(Symposium Secretariat, 1st International Symposium on Organic Chemistry in Technological Perspective, PO Box 50006, Tel-Aviv 61500, Israel.)

Ring-Opening Polymerization

22–26 June. 5th International Symposium on Ring-Opening Polymerization. Blois, France. (ROP 86 Secretariat, Laboratoire de Chimie Macromoléculaire, Université Pierre et Marie Curie, LA 24 Tour 44 — 1er étage, 4 place Jussieu, 75230 Paris Cédex 05, France.)

Synthetic Polymeric Membranes

7–10 July. 29th Microsymposium on Macromolecules. Prague, Czechoslovakia. (29th Microsymposium, P.M.M. Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 126 06 Prague 616, Czechoslovakia.)

Crosslinked Epoxides

14–17 July. 9th Discussion Conference on Macromolecules. Prague, Czechoslovakia.

(9th Discussion Conference, P.M.M. Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 126 06 Prague 616, Czechoslovakia.)

Chemical Thermodynamics

14–18 July. International Conference on Chemical Thermodynamics. Lisbon, Portugal.

(Dr J. A. Martinho Simoes, Complexo 1, Instituto Superior Tecnico, Av. Rovisco Pais, 1096 Lisboa Codex, Portugal.)

Analytical Chemistry

20–26 July. SAC 86: International Conference on Analytical Chemistry. Bristol UK.

(Miss P. E. Hutchinson, Secretary of the Analytical Division, Royal Society of Chemistry, Burlington House, London W1V 0BN, UK.)

Chemical Toxicology and Clinical Chemistry of Metals

27–31 July. International Conference on Bio- and Toxicokinetics of Metals (III COMTOX). Kitakyushu, Japan.

(Prof. Yasushi Kodama Secretary General VIth UOEH International Symposium and IIIrd COMTOX, UNIV OEH SCH MED PO ORIO, Yahata Nishi Ku, Kitakyushu, Japan.)

Photochemistry

27 July–1 August. 11th International Symposium on Photochemistry. Lisbon, Portugal. (Prof. Dr Sílvia M. B. Costa, Centro de Química Estrutural, Complexo 1, Instituto Superior Técnico, Av. Rovisco Pais, 1096 Lisboa Codex, Portugal.)

Organic Synthesis

10–15 August. 6th International Conference on Organic Synthesis, Moscow, USSR. (Dr G. V. Kondratieva, Scientific Secretary, Organizing Committee for the 6th ICOS, Academy of Sciences of USSR, N. D. Zelinsky Institute of Organic Chemistry, Leninsky Prospect 47, SU-117913 Moscow B-334, USSR.)

Pesticide Chemistry

10–15 August. 6th International Pesticide Chemistry Congress, Ottawa, Canada. (The 6th International Congress of Pesticide Chemistry, The Chemical Institute of Canada, 151 Slater Street, Suite 906, Ottawa, Ontario, Canada K1P 5H3.)

Carbohydrates

10–16 August. 13th International Carbohydrate Symposium. Cornell University, Ithaca, New York, USA. (Prof. James N. BeMiller, Department of Chemistry and Biochemistry, Southern Illinois University at Carbondale, Carbondale, Illinois 62901, USA.)

Solubility Phenomena

12–15 August. 2nd International Symposium on Solubility Phenomena. Newark, New Jersey, USA. (Dr Mark Salomon, 2nd ISSP, PO Box 254, Fair Haven, New Jersey 07701, USA.)

Non-aqueous Solutions

17–21 August. 10th International Conference on Non-aqueous Solutions, Leuven, Belgium. (Dr G. Maes, Department of Chemistry, University of Leuven,

Celestijnenlaan 200F, B-3030 Heverlee, Belgium.)

Zeolite Chemistry

17–22 August. 7th International Conference. Tokyo, Japan. (Prof. Hiro-o Tominaga (7 IZC), Department of Synthetic Chemistry, Faculty of Engineering, The University of Tokyo, Hongo, Bunkyo-ku, Tokyo 113, Japan.)

Natural Products

17–22 August. 15th International Symposium on the Chemistry of Natural Products. The Hague, Netherlands. (Dr G. J. Koomen, Secretary 15th IUPAC International Symposium on the Chemistry of Natural Products, Laboratory of Organic Chemistry, University of Amsterdam, Nieuwe Achtergracht 129, 1018 WS Amsterdam, The Netherlands.)

Physical Organic Chemistry

24–29 August. 8th IUPAC Conference on Physical Organic Chemistry. Tokyo, Japan. (VIIth ICPOC, The Chemical Society of Japan, 1-5 Kanda-Surugadai, Chiyoda-ku, Tokyo 101, Japan.)

Coordination Chemistry

24–29 August. 24th International Conference on Coordination Chemistry. Athens, Greece. (XXIV International Conference on Coordination Chemistry, c/o Dr E. Vrachnou-Astra, Department of Chemistry, N.R.C. 'Demokritos', PO Box 60228, 153 10 Aghia Paraskevi, Athens, Greece.)



The Netherlands Congress Centre, The Hague, venue of IUPAC sponsored Symposium on Chemistry of Natural Products.

Raman Spectroscopy

31 August–5 September. 10th International Conference on Raman Spectroscopy. Eugene, Oregon, USA. (Bruce Hudson, ICORS-X, Chemical Physics Institute, University of Oregon, Eugene, OR 97403, USA.)

Phosphorus Chemistry

31 August–6 September. International Symposium on Phosphorus Chemistry. Bonn, FRG. (Prof. Dr R. Appel, Anorg. Chem. Institut, Universität Bonn, Gerhard-Domagk-Str. 1, D-5300 Bonn 1, Federal Republic of Germany.)

Macrocyclic Chemistry

1–4 September. International Symposium on Macrocyclic Chemistry. Florence, Italy. (Prof. Mauro Micheloni (Secretary), Department of Chemistry — University of Florence, Via Maragliano, 75/77, I-50144 Florence, Italy.)

Phosphorus Chemistry

7–12 September. 2nd International Symposium on Phosphorus Chemistry Directed Toward Biology. Spala, near Lodź, Poland. (Prof. Dr W. J. Stec, Department of Bioorganic Chemistry, Centre of Molecular and Macromolecular Studies, Polish Academy of Sciences, PL-90 362 Lodź, Boczna 5, Poland.)

CHEMRAWN V

22–26 September. Current and Future Contributions of Chemistry to Health — The New Frontiers. Heidelberg, FRG.

(Gesellschaft Deutscher Chemiker, Abteilung Tagungen, PO Box 90 04 40, D-6000 Frankfurt am Main, Federal Republic of Germany.)

**Natural Toxicants.
Mutagenicity of Food.**

15–17 October. Interdisciplinary Conference (EURO FOOD TOX II). Zürich, Switzerland.
(Dr R. Battaglia, Kent Laboratory, Postfach, CH-8030 Zürich, Switzerland.)

**Environmental
Characterization**

10–12 November. International Symposium on New Sensors and Methods for Environmental Characterization. Kyoto, Japan.
(International Symposium SMEC, c/o Institute for Chemical Research, Kyoto University, Uji, Kyoto 611, Japan.)

1987

**Quantitative Luminescence
Spectrometry**

11–14 May. 2nd International Symposium on Quantitative Luminescence Spectrometry in Biomedical Sciences. Ghent, Belgium.
(Dr Willy R. G. Baeyens, Laboratory of Pharmaceutical Chemistry and Drug Quality Control, Faculty of Pharmaceutical Sciences, State University of Ghent, Harelbekestraat 72, B-9000 Ghent, Belgium.)

CHEMRAWN VI

17–22 May. CHEMRAWN VI. World Conference on Advanced Materials Needed for Innovations — Energy, Transportation and Communications. Tokyo, Japan.
(CHEMRAWN VI Coordinating Office, The Chemical Society of Japan, 1–5 Kanda-Surugadai, Chiyoda-ku, Tokyo 101, Japan.)

Free-Radical Polymerization

17–23 May. International Symposium on Free-Radical Polymerization: Kinetics and Mechanism. Santa Margherita Ligure, Nr. Genoa, Italy.
(Prof. Savgerio Russo, C.N.R. Center on Macromolecules, Corso Europa 30, I-16132 Genoa, Italy.)

Macromolecules

30 June–4 July. 31st International Symposium on Macromolecules. Merseburg, GDR.
(Technische Hochschule “Carl Schorlemmer”, Leuna-Merseburg, Macro 87, Otto-Nuschke-Strasse, DDR-4200 Merseburg, German Democratic Republic.)

Macromolecules

6–9 July. 30th Symposium on Macromolecules. Polymer-Supported Organic Reagents and Catalysts. Prague, Czechoslovakia.
(Dr P. Čefelín, Scientific Secretary, P.M.M. Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovského namesti 2, CS-16206 Prague 6-Petriny, Czechoslovakia.)

Bioinorganic Chemistry

6–10 July. 3rd International Conference on Bioinorganic Chemistry. Noordwijkerhout, The Netherlands.
(Prof. Dr J. Reedijk, State University Leiden, Gorlaeus Laboratories, PO Box 9502, NL-2300 RA Leiden, The Netherlands.)

Macromolecules

13–16 July. 10th Discussion Conference on Macromolecules. Small-angle Scattering and Related Methods.
(Dr P. Čefelín, Scientific Secretary, P.M.M. Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovského namesti 2, CS-16206 Prague 6-Petriny, Czechoslovakia.)

IUPAC Congress

13–18 July. 31st International Congress of Pure and Applied Chemistry. Sofia, Bulgaria.
(Dr R. Vlahov, Institute of Organic Chemistry, Bulgarian Academy for Sciences, 1113 Sofia, Bulgaria.)

Heteroatom Chemistry

19–24 July. International Conference on Heteroatom Chemistry (ICHAC-1987). Ibaraki, Japan.
(Prof. Shigeru Oae, Department of Chemistry, Okayama University of Science, Ridai-cho, Okayama 700, Japan.)

Coordination Chemistry

26–31 July. 25th International Conference on Coordination Chemistry. Nanjing, China.
(Prof. Guang-Xian Xu, Director of Inorganic Chemistry Division, Department of Chemistry, Peking University, Beijing, China.)

**Solute–Solute–Solvent
Interactions**

9–14 August. 8th International Conference on Solute–Solute–Solvent Interactions. Regensburg, Federal Republic of Germany.
(Prof. Dr J. M. G. Barthel, Institut für Physikalische und Theoretische Chemie, Universität Regensburg, Universitätstrasse 31, D-8400 Regensburg, Federal Republic of Germany.)

Trace Elements

17–21 August. 2nd Nordic Symposium on Trace Elements in Human Health and Disease. Odense, Denmark.
(Prof. Philippe Grandjean, Department of Environmental Medicine, Institute of Community Health, Odense University, J. B. Winslows Vej 19, DK-5000 Odense C, Denmark.)

**Fourier Transform
Spectroscopy**

24–28 August. 6th International Conference on Fourier Transform Spectroscopy. Vienna, Austria.
(Prof. R. Kellner, Institute for Analytical Chemistry, Technical University Vienna, Getreidemarkt 9, A-1060 Wien, Austria.)

1988

Natural Products

29 May–4 June. 16th International Symposium on the Chemistry of Natural Products. Kyoto, Japan.
(Prof. Sho Itô, Department of Chemistry, Faculty of Science, Tohoku University, Aramaki-aza-Aoba, Sendai 980, Japan.)

Macromolecules

1–6 August. 32nd International Symposium on Macromolecules. Kyoto, Japan.
(Prof. Takeo Saegusa, Department of Synthetic Chemistry, Faculty of Engineering, Kyoto University, Yoshida-machi, Sakyo-ku, Kyoto, 606 Japan.)

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Journal of the American Chemical Society

Volume 23

COPPER, SILVER, GOLD & ZINC, CADMIUM, MERCURY OXIDES & HYDROXIDES

Editor: T P DIRKSE, *Calvin College, Grand Rapids, MI, USA*

Interest in the title compounds has fallen into three phases: initial study of their solution chemistry, study of their role in the electrode reactions of alkaline batteries during and since World War II, and present concern over the mechanisms by which these elements can enter the environment through dissolution processes, sometimes with toxic results. This volume provides a complete compilation of solubility data published up to 1984, including all pertinent articles, together with critical evaluation of the data. Almost all the measurements relate to aqueous systems.

Of interest to inorganic, physical and analytical chemists, electrochemists and those concerned with environmental quality.

Contents: Foreword. Preface. Introduction: the solubility of solids in liquids. Copper(I) oxide. Copper(II) oxide and hydroxide. Silver(I) oxide. Silver(II) oxide. Gold(III) hydroxide. Zinc oxide and hydroxide. Cadmium oxide and hydroxide. Mercury(II) oxide. System index. Chemical Abstracts registry number index. Author index.

380 pp 272 x 188 mm 250 lit refs 1986
0 08 032497 5 Hardcover US\$100.00

Volume 24

PROPANE, BUTANE & 2-METHYLPROPANE

Editor: W HAYDUK, *University of Ottawa, Ontario, Canada*

This volume considers published solubility data for these three gases in a variety of solvent systems under various experimental conditions. The literature has been covered to the end of 1983. For each published paper, a compilation sheet gives the experimental solubility, the method of its determination, the purity of the materials and the experimental error where possible; the data are critically assessed by experts and classified accordingly. Of interest to physical, analytical and environmental chemists, polymer scientists and gas technologists.

Contents: Foreword. Preface. The solubility of gases in liquids: introductory information. Propane in water. 2-Methylpropane in water. Propane in water at high pressure. Butane in water at high pressure. Propane and butane in heavy water. Aqueous mixed solvent solutions, mainly electrolytes. Propane in non-aqueous mixed solvent solutions. Alkanes. Alkanes at high pressure. Non-polar solvents excluding alkanes and organohalides. Non-polar solvents excluding alkanes and organohalides at high pressure. Organohalides. Nitrogen-containing solvents. Alcohols. Other polar solvents. Other polar solvents at high pressure. Common solvents, and aqueous solutions or suspensions of biological substances. Mixed hydrocarbon solvents at high pressure. System index. Chemical Abstracts Registry number index. Author index.

447 pp 272 x 188 mm 500 lit refs 1986
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The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary, non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.

Its objectives are:

- to promote continuing co-operation among the chemists of the member countries;
- to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
- to co-operate with other international organizations which deal with topics of a chemical nature;
- to contribute to the advancement of pure and applied chemistry in all its aspects.

The membership of IUPAC presently comprises 42 countries, each represented by a national organization, such as an academy of science or research council.

National Adhering Organizations

Academy of Scientific Research and Technology
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Verein Österreichischer Chemiker (**Austria**)

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Bulgarian Academy of Sciences (**Bulgaria**)

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National Research Council, National Academy of
Sciences (**USA**)

Unija Hemijskih Društava Jugoslavije (**Yugoslavia**)

Chemistry International



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Chemistry International

The news magazine of the International Union
of Pure and Applied Chemistry (IUPAC)



1986, Vol 8, No 3 (June)

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Chemistry International

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	R. H. MARCHESSAULT <i>CHEMRAWN</i>	L. E. COLES <i>Division VI</i>
		D. B. TONKS <i>Division VII</i>
		<i>Secretary:</i> M. H. FREEMANTLE <i>Editor</i>

Subscriptions

Six issues of *Chemistry International* will be published in 1986. The 1986 subscription rate including postage is £26 (UK), £31 (overseas), US \$40 (USA and Canada). The individual subscription rate is US\$20. Microfiche subscriptions are available simultaneously with the printed edition, and microfilm at the end of the subscription year. Subscription orders may be placed directly with IUPAC's official publisher, Blackwell Scientific Publications Ltd, PO Box 88, Oxford, England.

Advertising. Enquiries should be sent to the Advertisement Manager, Blackwell Scientific Publications Ltd, Osney Mead, Oxford OX2 0EL, England (telephone + 44 (865) 240201).

The news magazine is delivered to North America by accelerated surface post and subscribers there can expect to receive their copies within two weeks of British publication. Current issues for the Indian Sub-Continent, Australasia and the Far East are sent by air to regional distribution points from where they are forwarded to subscribers by surface mail. Any back numbers are normally despatched by surface to all regions, except North America where they are sent by a.s.p., and India, where they are sent by air freight.

Reproduction of Articles

Reproduction or translation of articles in this issue is encouraged, provided that it is accompanied by a reference to the original publication in *Chemistry International*, unless there is a footnote to the contrary.

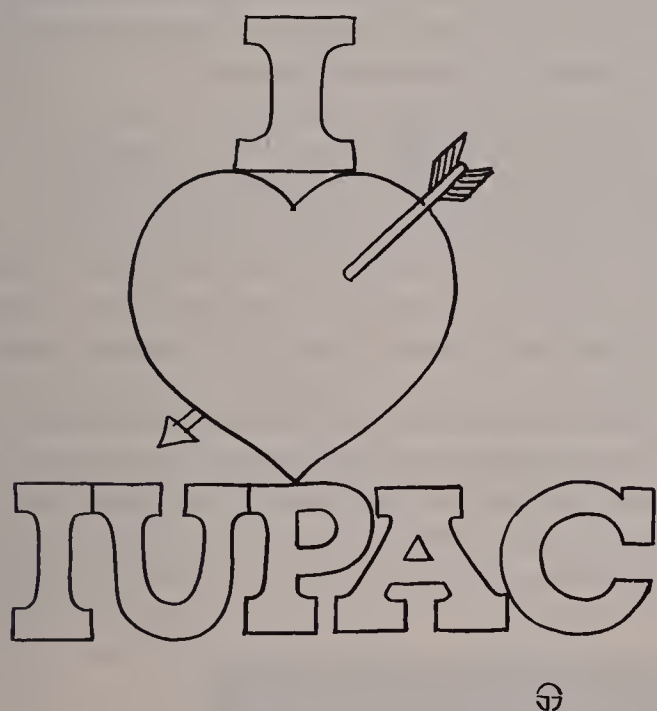
Front cover: Preparing low-cost equipment at a CTC workshop in Puerto Rico.

New title for CHEMRAWN IV

CHEMRAWN IV will now take place in the late summer of 1987 (see *CI*, Vol. 8, No. 1, p. 49, 1986). The additional time resulting from this postponement will provide opportunities to examine the structure of the technical programme and to consider incorporation of topics not adequately represented in the present format. In addition, there will be some restructuring of the organization. In anticipation of some expansion of the technical coverage, a new title for this meeting has been selected:

*Modern Chemistry and Chemical Technology
Applied to the Ocean and its Resources*

Flying the IUPAC flag



In his welcoming letter to IUPAC Affiliates, the Affiliate Affairs Secretary suggested that Affiliates might like to wave the IUPAC flag when attending a local, national, regional or international meeting on chemistry. Many IUPAC men do wear the elegant and distinctive IUPAC tie at such meetings. But how can IUPAC women wave the flag? In his letter the Affiliate Affairs Secretary invited Affiliates to write in with their ideas. Several Affiliates have suggested a pin — which could be worn by both women and men — whilst others have suggested brooches and scarves. One Affiliate suggested a Certificate of Membership with the IUPAC logo. If you are interested in any of these items or if you have any other ideas please write to the Affiliate

Affairs Secretary. If there is sufficient interest in a particular item he will arrange for it to be produced and offered for sale to IUPAC people.

We also asked our *Chemistry International* cartoonist to develop some ideas for flying the IUPAC flag. You can see the results scattered through these pages. We are particularly grateful to the Secretary General for modelling the hat!

As Affiliates will know, the welcoming set of documents included an order form for IUPAC ties. The demand for these has been substantial and the stock of maroon ties at the Secretariat was rapidly reduced to zero. A further supply has been ordered but meanwhile we apologize to Affiliates who are having to wait to fly the IUPAC flag.

Affiliate Scheme

By mid-April this year over 5000 chemists from 23 countries had enrolled as Affiliates. This number is expected to increase to about 5500 by July. By far the greatest contingent comes from the USA where over 4000 have enrolled. Almost 300 chemists enrolled as Affiliates in Japan and just over 300 in the UK. The current status of the Scheme is shown in the table below.

<u>Country</u>	<u>No. of Affiliates</u>
Argentina	22
Brazil	20
Chile	16
China	21
Ethiopia	10
Federal Republic of Germany	35
Ghana	4
Hungary	10
India	18
Japan	289
Malaysia	66
New Zealand	20
Papua New Guinea	9
Philippines	10
Republic of Korea	14
Singapore	29
Sri Lanka	9
Sweden	5
Switzerland	3
Thailand	10
Turkey	57
UK	309
USA	4164
	5150

Comments sought on basic definitions relating to polymers

No nomenclature document is more fundamental to a given area of science than the definitions of the basic terms used in that area. The Commission on Macromolecular Nomenclature published a document entitled "Basic Definitions Relating to Polymers" which appeared in *PAC*, Vol. 40, No. 3 pp. 479-491 (1974). That document defines fifty-two terms, including polymer, constitutional unit, monomer, polymerization, regular polymer, tactic polymer, block polymer, graft polymer, monomeric unit, degree of polymerization, addition polymerization, condensation polymerization, homopolymer, copolymer, bipolymer, terpolymer, copolymerization, and many others.

These definitions have now been in use for over ten years. The Commission believes that a revision of the original document may be advisable, and it seeks the opinions of interested scientists before undertaking this important task. It would especially like to hear of problems that may have arisen with these definitions in new areas of polymer science, but comments are also sought about any other shortcomings that may be perceived (inconsistencies, lack of conformity with terms used in other sciences, etc.).

Copies of the present definitions are available from the Secretary of the Commission, Dr N. M. Bikales, National Science Foundation, Washington, DC 20550, USA. Comments should be sent by him preferably before the next meeting of the Commission, scheduled for August 1986, but are welcome at any time.

Ewald Prize

The International Union of Crystallography has announced the establishment of the Ewald Prize for outstanding contributions to the science of crystallography. The prize consists of a medal, a certificate and a financial award. It will be presented once every three years during the triennial International Congresses of Crystallography. The first prize will be presented during the XIV Congress at Perth, Australia, in 1987. This year will be the seventy-fifth anniversary of the discovery of X-ray diffraction in 1912.

Any scientist who has made contributions of exceptional distinction to the science of crystallography is eligible for the Ewald Prize, irrespective of nationality, age or experience. No restrictions are placed on the time or the means of publication of his or her contributions. The prize may be shared by several contributors to the same scientific achievement.

Nominations for the Ewald Prize should be submitted in writing, accompanied by supporting documentation, to the Executive Secretary of the International Union of Crystallography, 5 Abbey Square, Chester CH1 2HU, UK. The closing date for nominations is 30 September 1986.

Biophysical chemistry

The extraordinary developments in molecular biology and its applications in recent years have led to a situation where it is often not meaningful to distinguish between the disciplines of chemistry and biology. Has IUPAC given enough attention to these developments? For instance, physico-chemical concepts and experimental techniques are now widely applied in work on living systems. But are the existing IUPAC recommendations for chemical nomenclature and terminology adequate for use in these areas? Is work in the "new biology" well supported with compilations of relevant physico-chemical data? Is there a need for guidelines concerning standard or reference materials? Is there a need for special education efforts in biophysical chemistry, for example, in initiating the preparation of monographs on methods and the sponsorship of summer schools?

Such problems were discussed when the Physical Chemistry Division Committee met during the General Assembly in Lyon in early September, 1985. A Working Party was formed to identify areas within biophysical chemistry where IUPAC might take action. The Working Party will also consider the crucial question of whether there is at present enough interest and competence within the existing Commissions of the Division to handle bio-oriented problems. Is there a need for creation of a special Biophysical Commission or other type of working body? Which liaison arrangements with other groups inside and outside IUPAC would then be desirable?



**Prof. I. Wadsö,
Chairman of the
Working Party on
Biophysical
Chemistry.**

The Working Party is made up of representatives of the Commissions of the Division: R. A. Alberty (Physicochemical Symbols, Terminology and Units), T. H. Lilley (Thermodynamics), K. Niki (Electrochemistry), K. J. Laidler (Chemical Kinetics), and L. Ter-Minassian-Sarraga (Colloid Surface Chemistry, including Catalysis). The Commission on Molecular Structure and Spectroscopy will also appoint a representative.

The Commission of Biotechnology from the Applied Chemistry Division has expressed a special interest in the work and has appointed B. Heinritz as a member of the group. The Analytical Chemistry Division will probably also be represented. International Union of Biochemistry (IUB), International Union of Pure and Applied Biophysics (IUPAB) and Committee on Data for Science and Technology (CODATA), which will be kept informed about the progress of the work, have been invited to communicate their views.

Comment and suggestions invited

A report by the Working Party will be circulated before IUPAC's next General Assembly (Boston, 1987) and will be discussed there. Comments and suggestions relating to the work are invited from

any interested individual and can be sent to the Chairman of the Working Party, Prof. I. Wadsö, Thermochemistry, Chemical Center, University of Lund, PO Box 124, S-221 00 Lund, Sweden.

I. Wadsö

IUPAC people

We regret to record the death of:

Dr N. Drescher, FRG (11 November 1985) — Commission on Terminal Pesticide Residues (1971–79), Commission on Pesticide Chemistry (1979–83).

Prof. L. Kosta, Yugoslavia (13 January 1986) — Commission on Analytical Radiochemistry and Nuclear Techniques (1956–83).

Dr R. Přibil, Czechoslovakia (2 February 1986) — Analytical Chemistry Division Committee (1961–65), Commission on Analytical Nomenclature (1961–63).

Dr P. Rhyner, Switzerland (15 February 1986) — Committee on Chemistry and Industry (1978–).

Who's who in IUPAC

A pen portrait of *Prof. Takeo Saegusa*, President of the Macromolecular Division (IV)

Prof. Takeo Saegusa was born in 1927. He received a higher education at Kyoto University, from which he graduated in 1950. When he went on to the graduate school at the same university, he decided to start research in polymer science, especially polymer synthesis. At that time, macromolecular science and its industries were beginning to develop, expand and diversify. Prof. Saegusa's PhD thesis was concerned with the chemical modifications of macromolecules. His first publication in 1953, which was in Japanese, was entitled "Vinyl Polymerization Initiated by Polyradical — Synthesis of Macromolecules Consisting of Polyacrylate Backbone and Polystyrene Branches". In short, he reported a new method for preparing "graft copolymers". It was really the dawning of research on graft and block copolymers. His first paper was published before the terminology of "graft copolymers" was proposed by Prof. H. F. Mark. He was thus one of the pioneers in this field.

From 1956–65, he was associated with Prof. J. Furukawa as an instructor and later as an associate professor. In this period, he explored several novel polymerization catalysts especially for aldehydes

and heterocyclic monomers. For example, he discovered some catalysts for the polymerization of acetaldehyde. These included alumina which gave an atactic (amorphous) polymer and aluminium alkoxide and aluminium alkyl which gave isotactic crystalline polymers. He also found a new catalyst in the alumina/Zn alkyl system for the epoxide polymerization. This produced polymers on super high molecular weights. The $\text{AlEt}_3/\text{H}_2\text{O}/\text{epichlorohydrin}$ system, which he found later, is an excellent catalyst for the polymerization of tetrahydrofuran.

In 1965, he was promoted to full professor at the Department of Synthetic Chemistry at the Kyoto university. He has continued to devote himself to the investigation of new polymerization reactions and new functional polymers. He discovered a new type of copolymerization which proceeds spontaneously without an added catalyst. The new copolymerization, which is termed "No Catalyst Copolymerization via Zwitterion Intermediates", is based on an innovative concept of the combination of a monomer having nucleophilic reactivity and a monomer having electrophilic reactivity. Interaction between these two monomers generates a



Prof. Takeo Saegusa.

zwitterion which is the key intermediate for the new copolymerization. The products are the so-called "alternating copolymers". This copolymerization has thus offered a means of regulating the alternating arrangement of two different comonomer units. Prof. Saegusa later expanded this copolymerization to ternary systems for producing terpolymers with sequence regularity. His work in this field stimulated the Nomenclature Commission of the Macromolecular Division of IUPAC to propose a new terminology for "Periodic Copolymers".

In his work on new polymers, Takeo Saegusa has been successful in producing graft and block copolymers of 2-oxazoline monomers. Polymeric blocks derived from 2-oxazoline monomers are regarded as polymer homologues of N,N-dimethylformamide or N,N-dimethylacetamide. These block and graft copolymers have been found to be very versatile as non-ionic surface active agents. They are compatible with many synthetic polymers and can be used as polymeric anti-electrostatic agents and as compatibilizers for cellulose derivatives with synthetic polymers.

In recognition of his contribution to polymer science, Prof. Saegusa was awarded the Chemical Society of Japan Award in 1978 and the Toray Science and Technology Prize in 1979. He is now a member of the editorial boards of several journals. These include *Macromolecules*, *Makromolecular Chemistry*, *Polymer Bulletin*, *Advances in Polymer Science*, and *Journal of Macromolecular Science*.

Prof. Saegusa was a member of Kyoto University Council from 1982–84. In 1985, he was appointed a member of Science Council of Japan. He is currently the President of the Society of Polymer Science, Japan. In 1979 he was elected on to the Macromolecular Division Committee of IUPAC and became Vice-President of the Division in 1981. He succeeded Prof. C. H. Bamford as President of the Division in 1985.

Affiliates in the USA

Last October, when members of the American Chemical Society (ACS) received their membership papers they were also invited to become Affiliate Members of IUPAC. The papers included a blue leaflet which gave details about IUPAC and the Affiliate Membership Scheme. The first ACS member to register as an IUPAC Affiliate did so on 4 October 1985. By mid-March this year over 4000 members had decided to become Affiliates.

Amongst the first to join the Affiliate Membership Scheme in the USA was Joan A. Deiters who is Associate Professor of Chemistry at Vassar College, New York. She has been teaching chemistry at the undergraduate level for about sixteen years. The reason she decided to join the IUPAC Affiliate Membership Scheme was her interest in issues considered by IUPAC and also to learn about international meetings.

Paul A. Longeway became an Affiliate with 'great eagerness' and says he would be honoured to have the opportunity to offer even the least input to this 'august body'. He learnt about IUPAC at high school and considers IUPAC's trans-national nature — which extends beyond the boundaries of politics — and also the free exchange of information in chemistry to be very important. Dr Longeway is currently engaged in

research on the vapour phase epitaxial growth of mixed III–V compounds at the David Sarnoff Research Center in Princeton, New Jersey.

Another ACS member who joined in October was Dorothy M. Feigl who is Acting Vice President and Dean of Faculty at Saint Mary's College, Notre Dame, Indiana. She felt that it is important to participate as a member of a global community — and IUPAC is the most clearly identifiable international body in chemistry. She hoped that *Chemistry International* would offer a broader perspective on issues.

C. Ariel Lou Fenton joined the Scheme to support an organization which has the potential to improve the communication of chemical information on an international scale. He says 'I am presently benefiting from the past efforts of others as in the future others may perhaps benefit from my present efforts. Some things



▲ James Turner.



Joan A. Deiters. ▼



C. Ariel Lou Fenton. ►

are done out of a sense of duty, so it is with IUPAC Affiliate Membership'. At present, Dr Fenton is working as a research plant physiologist in the Department of Pomology at the University of California. He is using biochemical techniques to try to determine the molecular basis for the plant disease 'noninfectious bud failure of almond'.

James Turner is already familiar with IUPAC. He has presented papers on time-resolved resonance

Raman spectroscopy at IUPAC conferences. For example, at the 1985 Manchester Congress (see *CI*, No. 6, pp. 36-40, 1985 and *CI*, No. 1, pp. 13-23, 1986). Dr Turner presented a poster entitled 'The heme-linked ionization of horseradish peroxides compound II, as monitored by the Fe(IV)=O Resonance Raman Frequency'. Dr Fenton is currently Assistant Professor at the Department of Chemistry, Virginia Commonwealth University.

The Association of Greek Chemists

The Association of Greek Chemists (AGC) is the Greek National Adhering Organization of IUPAC. It was founded in 1924 and membership is obligatory for all Greek chemists; chemical engineers may join if they wish. This report outlines the organization and activities of the AGC.

At present the Association has about 5000 members. It has a very important function in being the official adviser to the Greek Government on all matters concerning chemistry or the chemical industry. The Association is governed by the General Assembly of members which is held at least once a year and an

Administrative Council. The latter consists of nine members and is elected by secret ballot of active members every two years. The present Administrative Council, with Dr Christos D. Verelis as President and Dr Vasilis F. Boulias as Secretary General, was elected in May 1985. The Association is financed by the



Dr Christos D. Verelis,
AGC President.



Dr Vasilis G. Boulias,
AGC Secretary General.

individual membership fees. There are no official state subventions although, since 1981, governmental support has been received for various scientific activities.

The AGC has a Secretariat with an Executive Secretary and supporting staff. There is also a chemical library open to all scientists and students.

The scientific Divisions of the AGC include Divisions of:

- Medicinal Chemistry
- Organic Coatings (dyes, varnishes, inks)
- Clinical Chemistry
- Food Chemistry
- Plastics
- Chemical Education

Several committees and working groups concerned with various fields of chemistry and chemical industry and technology have also been established over recent years. These are mainly concerned with problems of public interest, such as protection of the environment, pollution, working conditions and protection of public health, drugs and cosmetics, and industrial development.

Publications

AGC publishes two journals:

Chimika Chronika — General Edition. This monthly journal is published in Greek. It contains various general interest articles on professional, scientific and international matters relating to chemistry.

Chimika Chronika — New Series. This is a scientific journal published in Greek, English, French and German four times a year.

Every year the Association organizes a National Congress on Chemistry. The 10th National Congress on Chemistry was held in Patras, Greece in December 1985.

Members of the Association represent the AGC in various governmental bodies, such as the Council of the National Drug Organization, the National Council of Health, the National Council of Higher Education and the National Council of Technical Education.

International Activities

Since 1964 AGC has been the Greek National Adhering Organization of IUPAC with two representatives at the IUPAC General Assembly. It also has representatives on many IUPAC Commissions and Committees. AGC is also a member of:

- The Federation of European Chemical Societies (FECS)
- The World Federation of Scientific Workers
- The European Federation of Chemical Engineering.

Finally, the Association has initiated collaboration with the Chemical Societies of Balkan Countries. This collaboration has resulted in the establishment of the Balkan Chemistry Day (BCD). BCDs take place every three years. The first BCD was held in Athens in 1980, the second in Varna (Bulgaria) in 1983 and the third will be held in Bucharest (Romania) this year.



AGC Headquarters, Athens.

Spotlight on the AOAC

IUPAC associates with 29 other international organizations whose aims and activities are “in harmony with those of the Union”. These organizations are known as Associated Organizations. One of these is the Association of Official Analytical Chemists (AOAC). The organization celebrated its 100th anniversary in 1984 and in 1985 the President of IUPAC presented the President of AOAC a commemorative scroll (see *CI*, No. 3, pp. 22–23, 1985). *CI* now takes a brief look at AOAC and its publications.

What is AOAC?

Founded in 1884, AOAC is an independent international association devoted to the development, testing, validation and publication of methods of analysis for foods, drugs, feeds, fertilizers, pesticides, water, forensic materials and other substances.

AOAC coordinates the development, testing, and validation of these methods and requires an inter-laboratory collaborative study before a method can be approved as official. Approval of methods is accomplished by vote of eligible organizations. Approved methods are published in *Official Methods of Analysis* (see below).

The actual work of devising and testing methods and initiating and carrying out collaborative studies is accomplished by a network of hundreds of volunteer-member scientists worldwide. The scientists work in their official and professional capacities as staff scientists in government, university and industry laboratories.

Other AOAC activities include annual and regional meetings, symposia, courses and training workshops; publishing the *Journal of the AOAC*, manuals, proceedings and other books, and *The Referee*, an information bulletin for members.

The AOAC membership is made up of individuals and organizations. Individual members are analytical science professionals: analytical chemists, biologists, microbiologists, biochemists, toxicologists, spectroscopists, and forensic and other scientists in laboratory, administrative, and management positions. Organization or Sustaining Members, are government agencies, and private firms and organizations with an interest in the development and interlaboratory evaluation of analytical methods.

Official Methods of Analysis

The 14th edition of *Official Methods of Analysis* was published in 1984. It is the major publication of AOAC.

This compendium contains over 1700 methods. Its step-by-step format specifies reagents and apparatus to be used. Alternative methods are often provided to accommodate a wide range of laboratory capabilities. The book is published every five years and is sup-

plemented between editions by four annual updates included in the purchase price.

This edition has been updated to enhance clarity and ease-of-use. Along with 165 additional methods, it includes the following features:

- Method performance parameters: within-laboratory and between-laboratory standard deviations for each method adopted since publication of the 13th Edition
- Easy-to-locate references
- Chemical and common names of all drugs and pesticides
- A greatly expanded index
- More-descriptive titles
- Chemical Abstracts Services (CAS) numbers wherever applicable

Since publication of the 13th edition new techniques have appeared and others have gained or lost popularity. The most rapidly growing technique is now liquid chromatography (HPLC). Of the 167 methods adopted in the past five years, 42 or approximately 25% involved chromatography. Internal standards have also been increasingly used for both liquid chromatography and gas chromatography.

Among the new techniques appearing in this edition are inductively coupled plasma (ICP) emission spectroscopy for simultaneous multi-element determinations, and hydrophobic grid membrane filter methods for enumeration of coliforms in foods. Automated methods continue to appear. One, for K_2O in fertilizers, is written in generic terms listing performance specifications rather than specific brands or models of instruments.

The book is edited by Sidney Williams. 1100 pp., 173 illus., index, hardbound. Price — members: \$133.95 in US, \$136.95 outside the US; non-members: \$148.50 in US, \$151.50 outside the US. The price includes 4 yearly updates. ISBN 0 935584 24 2.

Use of statistics to develop and evaluate analytical methods

The book reviews the basic operations used in the process of making measurements and gives general suggestions for planning experimental work so that appropriate statistical methodologies can be used to interpret the results. It includes a number of experi-

mental plans for developing and modifying analytical procedures, and also discusses evaluation of the data.

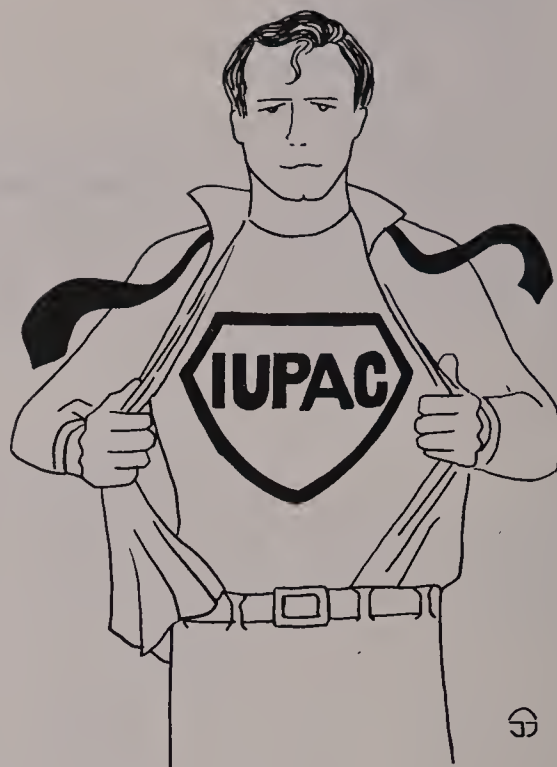
Other features include scores of specific statistical analyses of real-life data, many useful statistical tables, and very complete references.

The book, by Grant T. Wernimont, is edited by William Spendley. xvi + 183 pp, 1985, 11 Figures, 54 Tables, Index, Glossary. Price: (Softbound) Members: \$47.55 in USA; \$50.00 outside USA. Non-members: \$52.50 in USA; \$55.50 outside USA.

The Referee

This is the information bulletin of AOAC (not FIFA!). It appears monthly and contains news of analytical methods and AOAC personalities, meetings, and journals.

Enquiries about AOAC should be addressed to:
AOAC,
1111 N. 19th Street,
Suite 210,
Arlington, Virginia 22209,
USA



Fly the flag with a IUPAC T-shirt.

Education in Chemistry—Crossing National Boundaries

Prof. D. J. Waddington

IUPAC's Committee on Teaching of Chemistry (CTC) was formed in 1964 under the chairmanship of Sir Ronald Nyholm. The key purpose of CTC is "to act as an informational and coordinating body for chemical education activities throughout the world". This report reviews the current work of CTC.

The Committee has up to eight members. In addition, each country with IUPAC representation can nominate a national representative. The national representatives may attend all CTC meetings and they thus provide links between CTC and the national chemical education organizations and teachers of IUPAC's National Adhering Organizations (NAOs). This is obviously a vital role, and the success of the Committee's work depends on how vigorously the representatives become involved. As discussed later, there are means by which CTC is able to maintain links with countries which are not members of IUPAC.

The well-being of CTC's international endeavours is enhanced by a harmonious relationship with the various divisions of UNESCO — the UN agency most closely associated with chemical education. Furthermore, through the regional federations of chemical or science societies of Europe, Latin America, the Asian regions, the Arab region, and Africa, CTC is able to keep in touch with those chemists and chemistry teachers in countries which are not members of IUPAC. In the Asian region, we correspond with



Prof. Waddington, CTC Chairman at the Lyon General Assembly.

FACS (see Appendix I), and, as we shall see below, we are co-sponsors of the International Conferences on Chemical Education.

The success of these organizations and committees must be measured in terms of how they bring together chemistry teachers who do not have the means to come to meetings and how they can help teachers who do not have access to the latest literature to keep abreast of developments. So how does IUPAC CTC play its part in bringing together teachers worldwide and helping them?

Conferences

CTC arranges international conferences on chemical education. These are held every two years. The most recent are shown in the table below:

Table 1. International Conferences on Chemical Education.

Date	Place	Title	Reference
1975	Madrid, Spain	Education Technology in the Teaching of Chemistry	1
1977	Ljubljana, Yugoslavia	Chemical Education in the Coming Decades	2
1979	Dublin, Ireland	Interaction Between Secondary and Tertiary Level Teaching	3
1981	Maryland, USA	Teaching Chemistry in a Diverse World	4
1983	Montpellier, France	Chemistry, Education and Society	5
1985	Tokyo, Japan	Widening the Scope of Chemistry	—

One particular feature is that through these conferences chemistry teachers from many developed and developing countries can meet — for example, teachers from over 70 countries were present at both the Maryland and Montpellier meetings, and over a third of these were school teachers. The conferences are supported financially by UNESCO, and it is because of this that so many participants from developing countries can take part.

Publications

CTC produces the *International Newsletter on Chemical Education*⁶ twice a year. Over 3000 copies are printed per issue and distributed free via the national representatives, UNESCO, and directly from the editor. A recent issue was devoted to 'Chemistry and Society'. In this there were accounts of work going on in nine countries. Other issues have been concerned with the development of microcomputers in chemical education

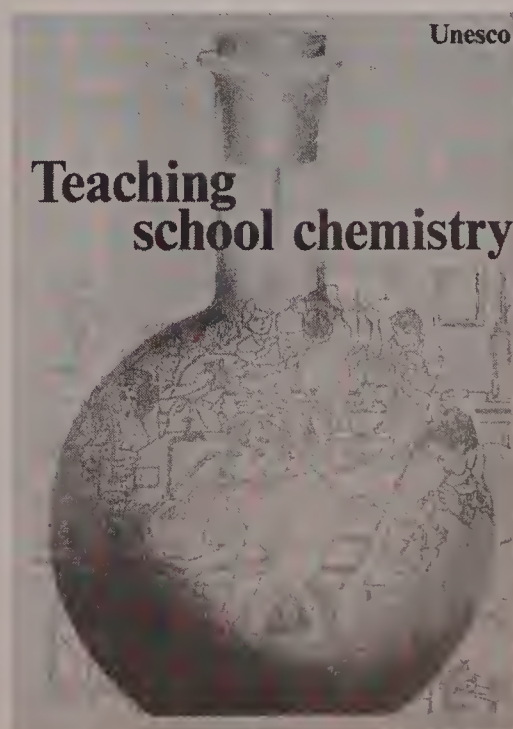
and the 150th anniversary of Mendelcev's birth including articles on the Periodic Law.

The newsletter promotes the exchange of ideas and the dissemination of information on chemical education all over the world. In the past four years it has contained articles about chemical education from Australia, Austria, Bahrain, Canada, Cyprus, Czechoslovakia, Denmark, France, FRG, GDR, Ghana, Japan, India, Israel, Italy, Kenya, Netherlands, New Zealand, Nigeria, Norway, Papua New Guinea, Portugal, Singapore, Sri Lanka, Switzerland, Togo, UK, Upper Volta, USA, Yugoslavia and Zimbabwe.

An anthology, published by CTC, entitled *Chemical Education in the Seventies*⁷, contained contributions from individuals in 40 countries. These outlined developments in chemical education in schools, colleges and universities. It proved so popular that we have had it reprinted. The book highlights major innovations and new programmes in these countries. The text provides a forum for the exchange of information about recent changes in curricula, assessment techniques, and other important aspects of chemistry teaching.

CTC has also produced several surveys in the last few years. The full reports can be obtained from their authors, abbreviated versions being obtainable in the newsletter. These include "Introduction of SI units in school and university teaching: implementation and difficulties"^{8,9}; "Survey of chemical education in developing countries"¹⁰, and "Survey on continuing education of chemists in industry"¹¹. In 1983, the Commission on Atomic Weights and Isotopic Abundances (II.1) revised a table of Atomic Weights specially for schools¹².

CTC is also involved in other publications. UNESCO uses the CTC itself and also its individual members, in their personal capacity, as consultants, writers and editors. Some recent examples include the series *New Trends in Chemistry Teaching*. The latest volume is an anthology of papers concerned with chemical education which have appeared in international and national journals¹³. It is grouped into nine sections: "Chemical



information"; "What should we teach and how?"; "Chemistry in space"; "Chemistry in the future"; "Controversies in teaching chemistry"; "Simple experiments"; "Low-cost equipment"; "Games and simulations" and "Chemistry and industry".

This year saw the culmination of an ambitious project. This was the publication of a book entitled *Teaching School Chemistry*¹⁴. The book has chapters on: 'The changing face of chemistry' (J. A. Campbell, USA), 'Curriculum innovation in school chemistry' (R. B. Ingle, UK and A. M. Ranaweera, Sri Lanka), 'Some methods in teaching chemistry' (A. Kornhauser, Yugoslavia), 'Practical work and technology in chemical education' (M. H. Gardner, USA, J. W. Moore, USA and D. J. Waddington, UK), 'Assessment of students' (J. C. Mathews, UK), 'Education and training of teachers' (A. V. Bogatski, USSR, D. Cros, France and J. N. Lazonby, UK), 'Current research in chemical education' (P. J. Fensham, Australia) and 'The future' (M. H. Gardner, USA). The book has been published by Unesco Press in English, Arabic, French and Spanish.

Workshops

CTC has also been involved with the UNESCO-inspired initiative to encourage laboratory work in college and university courses. This has taken the form of workshops, the first being held in Seoul, Korea, in 1975 for the Southeast Asian region¹⁵ and later ones being held in other regions¹⁶⁻¹⁸. In these workshops college and university teachers are brought together to test and devise experiments which can be implemented under the sometimes very difficult conditions under which they have to work. These conditions may include lack of basic facilities, few resources, large classes and inexperienced teachers.

From this work, it was logical to concentrate on two aspects: the supply of simple, robust equipment for the teaching of chemistry at this level and its maintenance.

CTC, with the support of UNESCO, initiated a low-cost, locally produced (LCLP) programme at the University of Delhi under the leadership of Prof. K. V. Sané and P. K. Srivastava, of the Departments of



Prof. K. V. Sané
examines some
low-cost equipment.

Chemistry and Physics, respectively. The group has several characteristics which are extremely important:

- It has grown out of enthusiasm at the University — it has not been planted there.
- The group consists of academic scientists of wide interests, students and technicians working together.
- There has been a strong element of self-reliance — wherever possible, the work has been done within the group using only locally available materials.
- The latest available technology is used which in turn keeps down costs.
- There is an insistence that the equipment is as reliable and accurate as that which is commercially available. Better still, teachers make the equipment during training, thereby being in the best possible position to maintain it. The extra pride and motivation the fabrication gives is understandable and vital to the success of the project.

Several regional workshops concerned with this project have been organized over the last few years; in Madras (India)¹⁹, Dakha (Bangladesh), Talawakalla (Sri Lanka), São Paulo (Brazil), Copenhagen (Denmark)²⁰, and members of the project took part in a recent meeting at Bathurst (Australia)²¹. A variety of institutions have helped with the organization and



CTC workshop in Puerto Rico.



CTC workshop in Jordan.

funding including COSTED and the Commonwealth Foundation.

The Commonwealth Foundation awarded Prof. Sané with its first Senior Visiting Practitioner Award in 1984. This enabled him to visit and organize activities in five Commonwealth countries and from this experience he wrote a booklet entitled *Science Education through Self-reliance*²². The Foundation is also helping with the infrastructure of the unit in Delhi.

Workshops in India, sponsored by the Indian University Grants Commission, have, like the regional activities, concentrated on teachers making and using equipment. Such workshops have been held in Delhi, Madras and Bombay.

The equipment so far developed has been mainly electrochemical, for example pH meters and conductance bridges. Many versions of this equipment are available. These suit the needs of universities, colleges and schools, and the various needs of teachers in different countries. Other apparatus includes a colorimeter and a spectrophotometer which is now under trial.

However, as C. N. R. Rao has pointed out, for the development of equipment, the 'single most crucial factor that determines success will be the availability of know-how to maintain and repair instruments. This is a terrible problem. The biggest boon to chemistry departments will be the provision of trained teachers and technicians who can at least repair and maintain simple equipment'²³. ICSU, CTS, COSTED and UNESCO have a joint programme to encourage the maintenance and repair of equipment in science laboratories in universities and colleges which are collaborating actively with CTC. The first workshop was held in Bombay in September 1981 and the second in Nairobi in April 1982. ICSU and UNESCO, with our collaboration, sponsored a workshop in Guyana in 1984. This dealt with both the fabrication of low-cost equipment and its maintenance.

All activities depend upon the community of chemistry teachers at every level, who are willing to give their time, their ideas and their energy, freely,

either working through their national representative or directly through the Chairman and Secretary of CTC. We will be delighted to hear from you if you want to take part and to help CTC to flourish (see Appendix II).

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Appendix I

CTC	Committee on Teaching of Chemistry
COSTED	Committee on Science and Technology in Developing Countries
CTS	Committee on the Teaching of Science
FACS	Federation of Asian Chemical Societies
ICSU	International Council of Scientific Unions
UNESCO	United Nations Educational, Scientific and Cultural Organization



Prof. Chastrette (left) presents the CTC report to the IUPAC Bureau in Lyon.

Appendix II

CTC Chairman

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Flying the flag?



"The Union is particularly keen that younger chemists should thus be offered the opportunity to participate in IUPAC activities and influence the way that chemistry's affairs are looked after in the world international scientific community." (Secretary General's column, *CI*, 1985, Vol. 7, No. 4, p. 7)



Indian National Science Academy, New Delhi, venue of the Officers' meeting in March.

Secretary General's column

The General Assembly of the Union, where all IUPAC bodies meet together, occurs in odd-numbered years. In non-Assembly years, such as 1986, the Executive Committee normally meets in spring to follow up the work of the General Assembly, initiate new business, and prepare for the Bureau meeting later in the year. In the past two biennia, when the Union has had to restrict the scientific work of the Divisions and Commissions because of funding difficulties, the Executive Committee has restricted its meetings so that a full Bureau meeting, which involves all the Division Presidents and Members elected by the Council, can occur. This pattern was followed again in 1986: only the Officers gathered for a meeting on 10 and 11 March at the Indian National Science Academy, New Delhi, where our President, Professor C. N. R. Rao, is presently also the President of the Academy. In addition to the President, those attending were Vice-President Valentin Koptug (USSR), Treasurer Anders Björkman (Denmark), Executive Secretary 'Mo' Williams (IUPAC Secretariat) and, yours truly, the Secretary General (UK).

New Delhi was enjoying a very warm spring with temperatures in the low thirties, which came as a shock to those of us who had arrived from near zero temperatures elsewhere. However, we were made most welcome and were immediately at home with our Indian hosts. Not so welcome was the enormously long and truly Williamsonian list of agenda items through which we had to plough! We had, however, to give due credit to the Executive Secretary, who on this occasion loaded us with only a modest 2.5 cm high stack of A4 paper to read. It was perhaps unfair that towards the end of the meeting certain Indian bacteria took the 'Revenge of the Raj' on Mo. But, as one of my fellow Officers remarked 'he has his mouth open even in the shower'. Mo-observers in IUPAC will know exactly what he meant. Perhaps the Executive Secretary should pick up a pen regularly and write an E.S. column, if only in self-defence against the Officers, which the Council Members in their wisdom thrust upon him from time-to-time.



Dr Williams who 'has his mouth open even in the shower'.

Relations with the International Council of Scientific Unions

IUPAC is a member of the ICSU family. The International Council for Scientific Unions (ICSU, see *CI*, No. 4, pp. 25–28, 1983) is the body which facilitates and coordinates the activities of the twenty or so International Scientific Unions and the international scien-



Prof. and Mrs Koptug in New Delhi.

tific activities of its National Members. It stimulates, designs and coordinates international interdisciplinary scientific research projects, such as the International Geophysical Year, and scientific education plays a prominent part in its programme. It also acts, in many ways, as the social conscience of science in encouraging international scientific activity for the benefit of humankind, so as to help promote the cause of peace and international harmony.

At New Delhi the Officers of IUPAC discussed several matters in which IUPAC interacts with ICSU. One of these related to IUPAC's traditionally strong stand on the freedom of scientists to participate in IUPAC-sponsored meetings in any country of the world, irrespective of race, religion, political persuasion, etc. ICSU is having its own problems in this respect, because of difficulties in the granting of entry visas.

Thus far, although IUPAC has had to threaten to withdraw its sponsorship on more than one occasion, it has always been able to persuade host countries to grant entry visas and has not yet had to withdraw sponsorship.

The ICSU General Assembly is held biennially in even years and is scheduled to take place in Berne, Switzerland, in September 1986. Several aspects of ICSU closely concern IUPAC, such as the proposed setting up of a Scientific Committee on Biotechnology, in which the IUPAC Commission on Biotechnology would play a part together with the Bio-Unions. I have to say that IUPAC would have preferred an interunion commission rather than a scientific committee. We are seriously concerned about the proliferation of biologically-oriented bodies, including unions, within ICSU. We are also interested in and have played a small part in the debate on the Environmental Consequences of Nuclear War (ENUWAR), which will figure prominently in the Berne Assembly. For the first time at an ICSU Assembly, we will be exhibiting a poster and displaying publications to bring our activities to the attention of the many scientists who attend from other disciplines and from many countries.

IUPAC nominates Zollinger for ICSU Vice-President

At the ICSU General Assembly in 1986, an election will be held for some of the Officer posts. One of these is for Vice-President. The person elected will, in fact, serve as President-designate, becoming President in 1988. On this occasion the IUPAC Officers decided to nominate one of our recent Presidents, Prof. Heinrich Zollinger of ETH Zürich. It would, we feel, be particularly appropriate to have a Swiss national elected in Berne. A previous chemist to hold the post was another former President of IUPAC, the late Sir Harold Thompson (UK), who was ICSU President in 1963. A previous Swiss to be ICSU President was A. von Muralt in 1949. Heini Zollinger was an outstanding President of IUPAC, devoting enormous energy and time to improving the organization and working of the



Prof. Heinrich Zollinger, next ICSU Vice-President?

Union, and also firmly setting it on an outward-looking course, which has had a profound beneficial effect on IUPAC. It is certain that he would make a first class President of ICSU. I am happy to report that the Swiss Academy of Sciences, which is the Swiss adhering organization to ICSU, has already endorsed our nomination of Prof. Zollinger. The Officers hope that all chemists who have influence with their national committees for ICSU will seek to advance his and our cause at the forthcoming ICSU elections.

Much of the Officers' IUPAC debate in New Delhi was concerned with financial matters, which are the province of the Treasurer rather than the Secretary General. I should, however, mention one: advising our Commission Members in future to take out insurance against medical and other expenses whilst on IUPAC duties. Arrangements are in hand to set this up for the General Assembly at Boston in 1987.

Invitations sought for 1991 General Assembly and Congress

At the IUPAC General Assembly in Lyon last year, the question was raised in the council of the future of IUPAC Congresses. These are broad-spectrum scientific meetings held in member countries, usually just before or after an IUPAC Assembly. In 1985 a very successful Congress was held in Manchester, UK, immediately after Lyon. In 1987, the 31st Congress is to be held in Sofia, Bulgaria (13–18 July). The 34th General Assembly in Boston, USA, is from 21 to 29 August. The 32nd Congress will be held in Stockholm, Sweden, during 2–7 August 1989, and the 35th General Assembly immediately afterwards in Lund from 9 to 18 August. Invitations to hold the 33rd IUPAC Congress will be open until spring 1987. In the event that no invitation is received there will be no 33rd Congress in 1991. An invitation to host the 1991 General Assembly is also sought by spring 1987.

Nationality of Division Presidents to be revealed before Bureau Elections

From time to time concern has been expressed that the Council should be made aware of the nationality of the Division Presidents, all of whom serve on the Bureau, before deciding the Elected Members to the Bureau. The Officers are to recommend that this should be initiated for the Boston Assembly. It has not been done previously because it has always been held that the Division Presidents represent their scientific disciplines (i.e. the Divisions) and not their own national views. However, several members of Council have been concerned to ensure as wide an internationality as possible in the Bureau, and it is planned to announce the nationality of the incoming seven Division Presidents on the first day of the Assembly in 1987. It is to be hoped that possible implications of this will not be to influence the choice of Division Presidents in future or that their views, once they are elected, will be mandated by their adhering organizations. The Officers



The Secretary General wearing one of his favourite hats.

also decided that in 1987 the Division Presidents should report early in the Council meeting, rather than towards the middle of the agenda as in the past. This will allow the Council to assess the financial requirements for scientific activities of the Union before it decides the IUPAC budget for the next biennium.

New Affiliate Affairs Committee mooted for IUPAC

The Officers have asked the Secretary General to prepare a discussion paper for the Bureau meeting in 1986, to examine the possibility of setting up an Affiliate Affairs Committee within the IUPAC structure to allow assessment of the benefits that IUPAC grants to Affiliates and additionally the contribution that Affiliates make or could make to the Union. A subsidiary aim of the Affiliate Membership Scheme is to allow National Chemical Societies, which are not National Adhering Organizations of IUPAC, to have some influence within the Union. The initial thoughts of the Officers are that the Secretaries of the Chemical Societies might be the best participants in such a body. They have a continuity which Chemical Society Presidents usually do not, and in addition they will probably be more directly concerned with the operation of their National Affiliates groups.

IUPAC Handbook to follow later this year

Preparation of the IUPAC Handbook for 1985–87, which includes details of all the Commission/Division members of IUPAC and of other committees, is well

under way now. It is our aim for copies to be distributed in autumn 1986. The new Handbook will also, for the first time, contain the Statutes and Bylaws of the Union, together with Division rules and terms of reference.

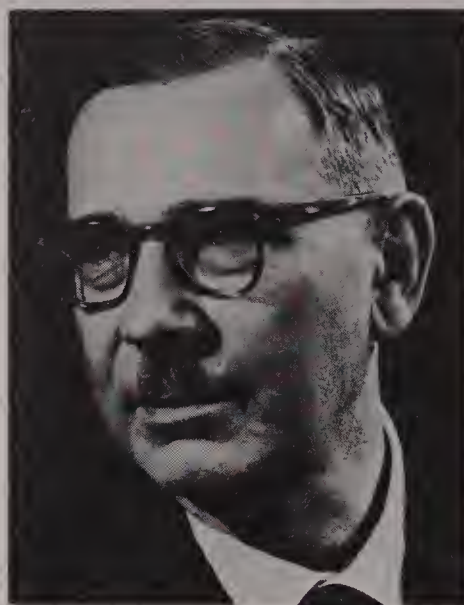
UN Year of International Peace

IUPAC has noted with approval the United Nations designation of 1986 as the Year of International Peace and hopes that the governments of its two largest member countries are in contact, with a view to reducing the number of nuclear weapons in their armouries. Chemists everywhere will, we are sure, wish that their discussions be successful and that the nuclear risk to humankind and the life of the planet will be progressively reduced as time goes on.

Farewell to Wilhelm Klemm, President 1965–67

Finally, I could not help but notice with sadness the mention of the death on 24 October 1985, of Prof. Wilhelm Klemm (FRG) in *CI*, No. 1, p. 4, 1986. It is not the custom of IUPAC to publish detailed obituary notices and, whilst I do not seek to violate that practice, one of the privileges of the Secretary General is that he writes a *personal* column. I take this occasion, therefore, to comment on someone I regarded as an all-time IUPAC 'Great' and under whom I first had the honour

to serve the Union. Prof. Klemm was one of the first representatives of the Federal Republic of Germany to join IUPAC after the Second World War. Looked upon as a pan-European in Europe itself, he rapidly won acclaim in the IUPAC structure and for many years afterwards he was looked upon as one of its most able elder statesmen. Apart from being a first class chemist and one of FRG's most distinguished scientific sons, he was also a gentle and courteous man, who was as popular with the younger generation as with the old. His service to IUPAC was outstanding and included the widely disseminated "Klemm Report" — The Work of IUPAC: 1957–67. Frau Klemm died shortly before him. Sadly there is no surviving family.



Prof. Wilhelm Klemm.

Commission & Committee News

When is a sample not a sample?

A recent provisional proposal prepared for the Commission on Analytical Nomenclature (V.3) entitled "Nomenclature of Sampling in Analytical Chemistry" attempts to provide the answer to the title question. It quotes 15 different usages and misuses of the term "sample" which were found in the analytical literature. The term sample has been used directly or as an adjunct for the concepts of material in general, analyte, amount, matrix, aliquot, phase, test portion, test solution, treated solution, stream splitter, injection loop, specimen, cell length, subdivide, and determination. Analytical chemists have found that the word "sample" is extremely useful and versatile, and colloquially apply it as an all-purpose term related to the material being analysed. In many cases the meaning is apparent from the context, but in some cases the meaning is ambiguous or obscure and in these

cases it is not known immediately what concept is meant.

The document recommends that the use of the term "sample" be restricted to "a portion of material selected in some manner from a larger quantity of material". The term "sample" should be used only when the result obtained on the small portion is merely an estimate (in the statistical sense) of the amount or concentration of a constituent or property of the parent material, that is "a sampling error", exists. If there is no or negligible sampling error, the portion removed is a test portion, aliquot, specimen, or the material itself. By this concept, the term "sample" would no longer be used as an adjective to identify the material being analysed. A "sample solution" would thus become a "test solution". The meaningless phrase "sample thickness" as applied to a spectrophotometric cell length would be abolished. Once a test portion (not a sample) has



Is this a sample, test portion, aliquot, specimen, or is it the material itself?
(Photo courtesy Unesco/Almasy-Vauthey)

been removed from the test sample, which in turn is prepared from the laboratory sample, the term "sample" as an adjective would no longer be appropriate, since the chemical operations subsequently involved in the analytical procedure, such as reactions, separations, or aliquoting, do not introduce a sampling error.

The document also introduces some additional concepts which are not often apparent to analytical chemists. It points out that the analytical chemist's responsibility usually begins with the laboratory sample, yet he is expected to characterize a lot on the basis of a sample over which he has had no control. Nevertheless, the analytical chemist must have a perception of the uncertainty involved in sampling external to the laboratory, since this determines to a large extent the variability that can be tolerated in the analysis.

Other important distinctions are made between the concepts of sampling from bulk materials and from packaged material as well as sampling under static conditions (a pile of coal) and under dynamic conditions (a flowing stream). The common practice of physically compositing individual portions (termed "increments" in the sampling literature) removed from a bulk lot, eliminates the possibility of determining the uncertainty involved in the sampling operation. Such well-intentioned pooling of individual samples destroys the ability of the chemist to differentiate analytical error from sampling error when a second sample from the same lot gives a different value.

Draft copies of the provisional proposal are available from Dr William Horwitz, Scientific Advisor, HFF-7, Food and Drug Administration, Washington, DC 20204 USA.

Teaching materials for CHEMRAWN

When the Committee on the Teaching of Chemistry (CTC) met in Lyon it decided to make specific proposals for work with CHEMRAWN to produce teaching materials (background information for teachers) based on the CHEMRAWN conferences. It was considered that these would provide invaluable authoritative data and information, particularly for teachers pursuing topics concerned with chemistry in society.

It was also proposed that an annual award be given to chemical educators who make outstanding contributions to chemical education internationally.

The third draft of the *Safety in Schools* booklet prepared by Mr Hitchings was received at the meeting. It is being circulated for comment and it is hoped to publish it in collaboration with UNESCO during the coming year.

The 8th International Conference on Chemical Education (8th ICCE) was held in Tokyo, Japan, August 1985. There were over 500 participants from 53 countries. The 9th International Conference will be held in São Paulo, Brazil, July 1987. In addition, an International Seminar on University Teaching of Chemistry will be held in Italy, September 1986, to coincide with the next CTC meeting.

Low-cost equipment regional workshops for 1984–85 have been held in Dhaka, Bangladesh and in Sri Lanka. CTC has also been involved with those held in Bathurst, Australia and Ljubljana, Yugoslavia. Another is being arranged in Bombay, India, for December 1985 and it has been proposed to hold 1986–87 workshops in Islamabad, Pakistan and Beijing, China. We are also collaborating with a

group at the University of São Paulo, Brazil.

Two more issues of the *International Newsletter on Chemical Education* have been prepared. The December 1985 issue is concerned with the 8th ICCE.

Teaching School Chemistry, a book published by CTC on behalf of UNESCO, has been published in English and Arabic. Two more translations, in French and Spanish, are being prepared. Copies may be obtained from UNESCO distributors, price 70FF or equivalent.

CTC is also working with UNESCO on a Regional Workshop at the University of Zimbabwe, devoted to the use of microcomputers in chemical education.

CTC worked with ICSU on the Conference on Science and Technology Education for Future Human Needs, Bangalore, August 1985. Professors Kornhauser and Waddington were group leaders and editors of two of the volumes to be produced. Mr Hitchings, Prof. Kempe and Prof. Jarisch were among those who wrote papers for the meeting.

D. J. Waddington



Dr Varadarajan
in Lyon.

CHEMRAWN focuses on safety in chemical production

The ever-growing needs for food, shelter, health and improvements in the quality of life of all mankind cannot be realized without a further large increase and spread of chemical manufacture. Fertilizers, pesticides, agro-chemicals, polymers, fibres, synthetic drugs, antibiotics, surface active agents, dyes, etc. are the essentials for the support of life and for its improved quality. With this background, it is hardly surprising that in the aftermath of the Bhopal incident the question: "What role should IUPAC play in chemical safety?" should be a topic of discussion within the IUPAC Commissions and Committees.



The CTC meeting in Lyon.

In a joint meeting on 3 August 1985 with COCI (Committee on Chemistry and Industry) the ground was laid for the proposal adopted unanimously by the CHEMRAWN (CHEMical Research Applied to World Needs) Committee: "It is the sense of the CHEMRAWN and COCI Committees that IUPAC has a responsibility to address the question of chemical safety in its broadest aspects".

A three-man committee consisting of Dr Bryant Rossiter, Chairman of the CHEMRAWN Committee and two committee representatives, Dr Alan Hayes and Dr S. Varadarajan, made a formal presentation of the CHEMRAWN/COCI proposal to the IUPAC Bureau. The proposal, which was also endorsed by the General IUPAC Assembly, concluded: "... in view of the importance of safety and its practice and perceptions in both the developing and developed world, that Dr Williams Schneider, immediate past President of IUPAC, be appointed to head the study team to identify goals, objectives and proposed initial activities for this new IUPAC initiative".

R. H. Marchessault

Subcommittee on biophysical chemistry formed

The Physical Chemistry Division Committee met in Lyon, 30 August–4 September 1985 to handle administrative matters of the Division, to discuss the programmes of its six Commissions and to plan future activities.

The Division was pleased to learn the terms of the new publication contract, which has incorporated the Division's previous strong recommendations on (a) facile republication in speciality journals of Recommendations from PAC and (b) reduction in cost of books based on IUPAC work. The suggestion was made that dissemination of Recommendations could be further enhanced if the Secretariat were to send copies from PAC to major chemistry publishers as guidance for authors and editors of textbooks.

There is a trend in IUPAC toward formation of inter-Divisional Commissions such as the Commis-

sion on Chemical Kinetics (I.4). While applauding the concept, the Division Committee noted some problems in the membership and administration of Commission I.4. These must be resolved for that Commission and other inter-Divisional Commissions. It is essential that a core membership of at least four (but preferably more) Titular Members be appointed without responsibilities in other Commissions so that they can work effectively at a General Assembly. Additional members from other Commissions and Divisions can then increase the breadth of expertise available.

A Subcommittee on Biophysical Chemistry, chaired by Prof. I. Wadsö, was formed and will report directly to the Division Committee. Within the next two years this group will identify activities related to the physical chemistry of biological systems in which IUPAC action is needed and will assess the need for a formal body within Division I. This Subcommittee will seek representation from other Divisions and advice from outside IUPAC.

The Division Committee noted with pleasure the formation of an IUPAC Committee on Chemical Databases. Division I is expected to be heavily involved in preparation and evaluation of such databases.

The Committee also discussed the roles of National Representatives to Commissions in the light of the Secretary General's concern over resources being expanded in providing services to National Representatives. The Committee concluded that *active* National Representatives should be encouraged since they (1) often broaden the geographic base of IUPAC; (2) may aid in dissemination of Recommendations; and (3) sometimes provide additional specialized expertise not available among Titular and Associate Members of Commissions.

E. D. Becker

Success of alkane and alkanol mixtures workshops

The meeting of the Commission on Thermodynamics (I.2) and its Subcommittees on Thermodynamic Tables and on Transport Properties in Lyon, 30 August–2 September 1985 was very much an interim meeting. Most of it was concerned with reviewing work expected to come to fruition in 1986 or 1987. In general progress was satisfactory. The project concerned with the symbols and nomenclature of thermodynamics required the most work and consultation. The difficulty of

balancing the need for clarification of meaning against over-elaboration of symbolism is exceeded only by the difficulty of balancing innovation against tradition.

An important aspect of the work of this Commission is its collaboration with other bodies. The present state of relations with the appropriate sections of CODATA (Committee on Data for Science and Technology), IUB (International Union of Biochemistry), IUPAB (International Union of Pure and Applied Biophysics) and EFChE (European Federation of Chemical Engineering) were reviewed and a report of a Commission Task Group was received suggesting that it was feasible to set up an early-warning system so that Conference dates could be arranged to avoid clashes. The *Journal of Chemical Thermodynamics* is in a healthy state but the *Bulletin of Chemical Thermodynamics* is at present suffering the pains of computerization.

The success of the latest International Conference on Chemical Thermodynamics at Hamilton, Canada in 1984 was reviewed, as were the preparations for the 1986 Conference at Lisbon, Portugal on 14–18 July. The 1988 Conference is to be held in Prague, Czechoslovakia.

No new projects have been started by the Commission, but feasibility studies on projects for the nomenclature of dilute solutions and for the critical review of critical properties will report in 1986.

The Subcommittee on Thermodynamic Tables continues its project on pure fluids. Books on oxygen, fluorine and methanol are in progress and a revision of the 1972 book on ethylene is under way. The Subcommittee's first venture into the field of mixtures was very successful. Two workshops on alkane + alcohol mixtures were held, the first in Warsaw in 1984 and the second in Paris in 1985. These attracted about one hundred participants. A third workshop is planned in 1987, when a definitive report on the subject will be produced.

The Subcommittee on Transport Properties has published four scientific papers to date and also prepared a draft report on reference data for the thermal conductivity of liquids. It is also cooperating in the production of an international data base on experimental data.

As a result of the twelve-year rule the Commission lost both its Chairman and Secretary and found itself with only two Titular Members eligible for re-election. However, in line with the hopes of IUPAC, its new members are young and active. The new Chairman is Prof. G. Somsen and the new Secretary, Dr. H. V. Kehiaian.

The next meeting will be held in Lisbon, Portugal, 14–18 July 1986.

S. Angus

Seven further definitive correlations await publication

When the Subcommittee on Transport Properties of the Commission on Thermodynamics (I.2) met in Lyon, 30 August–2 September 1985, it dealt with progress on the Subcommittee's projects. These are the international collaborative data bank of transport properties, the definitive correlation of transport property data for specific fluids and the establishment of standard reference values for the transport properties of fluids. Good progress was reported on all of these activities and oral reports on the assignments accepted by members of the Subcommittee were presented. Discussion of the reports resulted in the decision to prepare seven new papers for publication under the auspices of the Subcommittee. These will deal with topics ranging from the transport properties of argon and oxygen over the entire fluid range to a set of standard reference values for the thermal conductivity of liquids. Other work is also progressing towards the stage of publication.

The next meeting will be held in Lisbon, Portugal, 14–18 July 1986.

W. A. Wakeham

Part I of new Red Book is in its last phase

A great deal of the work of the Commission on Nomenclature of Inorganic Chemistry (II.2) during its session in Lyon, 24–29 August 1985 was dedicated to the finalization of Part I of the new edition of the Red Book. This will be an extensively revised and improved version of *Nomenclature of Inorganic Chemistry*, Pergamon, 1970. This project has been of major concern to the Commission during the past few years. An extraordinary meeting of the Titular Members was held in London, 10–12 April, 1985 to accelerate the process and help authors of the different chapters to reach decisions on certain difficult points. In Lyon, the Commission had to deliberate on documents as follows.

Chapters I-1 (Aims, Functions and Methods) and I-2 (Grammar) were reviewed by referees and are soon to be submitted for approval of the Division and IDCNS after redrafting. Chapters I-3 (Elements, atoms and salts) were approved by the IUPAC bodies and are now waiting feedback from the chemical community after having been given publicity by special announcements and publication of synopses in chemical journals of several countries. Major concern has arisen over two topics treated in Chapter I-3: the Periodic Table and the names of heavy elements. The Commission found it necessary to reassert its previous stand on

this subject by re-endorsing its past decisions approving the 18 column Periodic Table and the number-based names and three-letter symbols of the heavy elements. Chapters I-5 (Names based on stoichiometry) and I-7 (Neutral molecular compounds) were definitely approved and are now ready to go to referees. Chapter I-6 (Solid state chemistry, a joint document with Commission II.3) is now ready to go to Division and IDCNS approval.

Chapter I-9 (Oxoacids) is under the refereeing process and Chapter I-10 (Coordination compounds) is to be submitted soon to referees. Chapter I-11 (Boron) was discussed at some length. It has to be abridged and redrafted.

The chapter on "Nomenclature of polyanions" to be included in Part II of the Red Book is now approved by IDCNS.

A joint meeting with the Commission on Nomenclature of Organic Chemistry (III.1) was held as usual, and the chairman of the two Commissions exposed their current programmes and future projects. Working parties from both Commissions met to deal with subjects of common interest, namely: Oxoacids, Boron Compounds, Ions and Radicals, Organometallic Compounds and Rings and Chains.

The Commission also defined its ongoing activities which are: the finalization of the 11 Chapters of the new Red Book, and work on new nomenclature chapters for Part II such as "Chain compounds", ring compounds and stereochemistry. It also defined its new projects: Boron compounds, Compilation of Ion and Radical names, Organometallic Compounds, Metal Clusters and Ligand Abbreviations. Convenors and working parties were set up for every project.

The next meeting will be held in Heidelberg, FRG, 16–21 August 1986.

E. Samuel

Revision of the 1979 Edition of "Nomenclature of Organic Chemistry"

A complete draft of Part I, which will present the basic principles for the derivation of an unambiguous, though not necessarily unique, name for an organic compound, was presented and discussed extensively when the Commission on Nomenclature of Organic Chemistry met in Lyon, 24–29 August 1985. Selected topics for Part II were considered, including rules for deriving a unique IUPAC preferred name, assemblies of identical units, amines, and rules for selecting a preferred parent structure.

Comprehensive documentation of nomenclature for radicals, ions, radical ions and related species; natural products (Section F); and fused ring



Dr G. P. Moss (Chairman) and
Dr W. H. Powell (Secretary) at the
Commission on Nomenclature
of Organic Chemistry meeting in Lyon.

systems have been prepared and are under intensive evaluation.

Nodal numbering, a new, powerful method for numbering all atoms of a structure, developed by N. Lozac'h *et al.*, is being studied for applicability to organic structures. Its principles for acyclic and cyclic structures have been documented and are being evaluated as a possible method for numbering cyclophanes (see below). Its principles for "assemblies", that is, combinations of acyclic and cyclic structures, are being evaluated as a method for numbering natural product structures.

Numbering methods for cyclophanes used at the Beilstein Institute have been documented and are being compared with nodal numbering (see above).

Glossaries of class names and of stereochemical terminology are being prepared in cooperation with other IUPAC Commissions. Other topics under study include; acid nomenclature, indicated and added hydrogen and stereochemical nomenclature (Section E).

The next meeting of the Commission will be held in Heidelberg, FRG, 23–29 August 1986.

G. P. Moss

Ribbon cutting ceremony

The Commission on Electroanalytical Chemistry (V.5), when it met in Lyon, France, 31 August–3 September last year, reviewed activities including the publication of 13 reports in *PAC* and an *Anthology of Chinese Translations of Selected Reports of the Commission on Electroanalytical Chemistry* (Fujian Science and Technology Publishing House, People's Republic of China, 1984). These account for more than half of the total number of publications of the Analytical Chemistry Division during the 1983–85 biennium. Seven projects were completed, two were dropped and ten are being continued. Two new projects were initiated, namely: "Flow-through Electroanalytical

Techniques" and "The use of Ion-chromatography for anion analyses in Aqueous Samples".

The Subcommittee in Electroanalytical Methods of Environmental Trace Analysis reported on the completion of two projects, the abandonment of one, and the initiation of the following six new projects:

- Using Voltammetric Techniques for Complexation Measurements in Aqueous Media: Role of the Size Distribution of the Complexants
- Interpretation of Voltammetric Speciation Measurements without Sample Pretreatment
- Case study: Polarographic Determination of Fe(II), Mn(II), and S(-II) in Anoxic Waters
- Adsorption Stripping Voltammetry in Trace Analysis
- Application of Ion Chromatography to the Determination of Airborne Pollutants
- Critical Compilation of Electrochemical Data of Biological Systems

One Subcommittee report has been published in *PAC*, and three are in press in a book.

The highlight of the year was the publication of the book *Standard Potentials in Aqueous Solution* (Editors: Bard, Jordan, Parsons, published by Marcel Dekker, Inc, New York, 1985) after eight years of joint efforts of Commissions I.3 and V.5. This was celebrated in a ribbon cutting ceremony by the President of IUPAC.

An off-year meeting has been scheduled for October 1986, in Milano, Italy.

K. Izutsu

Interdivisional meeting on biotechnology

In an open meeting at Lyon attended by representatives of all IUPAC Divisions, the Applied Chemistry Division (VI.2) on Biotechnology presented its new programme and potential membership list for discussion and recommendations.

The major point developed was that biotechnology is a vast field and that the Applied Chemistry Division Commission (VI.2) has outlined a preliminary set of tasks which it will address. The Commission will focus on uses of biological processes in applied chemistry. The President of the Applied Chemistry Division emphasized that all Divisions in IUPAC can play important roles in biotechnology and encouraged them to develop biotechnology-related programmes. By doing this, IUPAC will establish a stronger overall programme.

The restructured Commission on Biotechnology has put forth eight new principal tasks, which are:

1. Compilation of quantities, values and parameters in biotechnology; development of a glossary of terms and a nomenclature for biotechnology.
2. Evaluation and recommendation of analytical and other chemical techniques of use in biotechnology.
3. Assessment of effects of biological systems on

the environment and on technical systems.

4. Systemization of "type reactions" in biotechnology.
5. Assessment of applicability of new biotechnological products.
6. Assessment of new sources of raw materials from biotechnology.
7. Elaboration of an educational programme in biotechnology for the chemical community.
8. Assessment of the applicability of biotechnology to world problems.

All Divisional representatives agreed that this was an appropriate programme for Commission VI.2. Several specific comments were offered about related projects in Divisions other than Applied Chemistry. Some additional aspects of the tasks of VI.2 were suggested for future planning.

There was general enthusiasm and encouragement for the restructured Commission on Biotechnology and its planned undertakings.

Data base for stability constant data to be implemented

The main items discussed by the Commission on Equilibrium Data (V.6) at their meeting held in Lyon, France, 31 August–3 September 1985 were existing projects and new projects.

Existing projects

1. *Critical evaluation of stability constants.* Two evaluations have been published in *Pure and Applied Chemistry (PAC)* since 1983. These concerned diaminoethane and complexes of histidine, phenylalanine, tyrosine, DOPA and tryptophan. A completed draft on cyanides was received and a further draft on thiocyanates was expected shortly.

Two new evaluations on complexes of nucleotide bases and on carbonates complexes were approved and further evaluations on halide complexes and complexes of aminoalcohols were accepted for probable approval later.

2. *Natural waters project.* Volume 2, containing 5 papers from Commission V.6 is now complete and should be published during 1986.

3. *Metal complex equilibria with organic*

polyelectrolytes. Drafts of three papers were received and others are expected shortly. The project should be completed by 1987.

4. *Compilation of stability constants.* This is the work of the Subcommittee V.6. The project was reported to be well in hand. Literature values were being collected for entry into a computer database. The database, which was implemented in Stockholm, was now ready for data entry and would allow the preparation of camera-ready copy in the first instance. Future developments should allow individual access to the data through a computer. Because of the importance of the database it was agreed that this aspect of the work should be proposed as a new project, and that the database should include protonation constant data. This is to be implemented when the present compilation of metal complex stability constants is completed.

5. *Rationalization of ion exchange data.* Since the proposed author of this project had withdrawn and no suitable alternative author was available it was agreed that this project should be cancelled.



Commission V.6 in Lyon.

New projects

The following new projects were approved:

1. Critical survey of metal complex stability constants of nucleotide bases.
2. Critical survey of metal complex stability constants of carbonates.
3. Development of a database for stability constant data.
4. A recommended procedure for testing the apparatus and techniques for the pH-metric measurement of metal complexes stability constants.
5. A proposed standard format for the publication of stability constant data.

The following projects were accepted for further study and clarification:

- Critical evaluation of stability constants determined in sea-water.
- Determination of stability constants for solid-liquid absorption equilibria.
- Compilation and critical evaluation of stability constants determined in molten salts.

The next meeting will be an informal meeting held during the International Conference on Coordination Chemistry in Athens, Greece, August 1986.

L. D. Pettit

Lack of information on radiochemistry and nuclear techniques

The newly reconstituted Commission of Radiochemistry and Nuclear Techniques (V.7) held its first meeting in Lyon, France, 1–3 September 1985. The Commission is under the purview of the Analytical Chemistry Division with participation by the Inorganic, Applied, and Clinical Chemistry Divisions. It is one of only three such interdivisional Commissions. The following five projects were selected by the members and proposals were prepared for consideration and approval by the Division Committee:

1. Sources of information about radiochemistry and nuclear techniques.
2. Radioanalytical procedures for the determination of speciation of trace components in biological systems.
3. Radiation-induced chemical reactions with practical implications.
4. Critical evaluation of half-lives of naturally occurring radionuclides.
5. Facilities for determination of very low levels of radioactivity.

Of these projects, the first three directly address the Commission's aim to remedy the non-specialist's lack of information on radiochemistry and nuclear techniques. The first three projects are scheduled for completion by 1987 and the others before 1989. Other methods for disseminating information to both scientists and lay people concerning the value and potential applications of radiochemistry and nuclear techniques were discussed.

Seven papers were submitted to the Commission for review and approval by December 1, 1985.

The "terms of reference" for the Commission, formulated by the Chairman, were discussed and approved. A key point is to show the applicability of radiochemical and nuclear techniques to a wide variety of industrial and fundamental problems.

Darleane C. Hoffman

New Working Group on Vitamin Analysis established

The Commission on Food Chemistry (VI.1) currently consists of ten Working Groups, each covering an area of food chemistry of high interest and active research internationally. The most active Working Groups at this time involve the study of food contaminants (for example the Working Groups on Mycotoxins). However, during recent years an effort has been made to branch out into studies of the intrinsic components of foods (for example, the Working Groups on the Effects of Food Processing). In a continuation of this trend the Commission has approved the establishment of a Working Group on Vitamin Analysis.

At Lyon, five new projects were approved by the Commission:

1. Determination of calcium and magnesium in foods and biological materials.
2. Collaboration study of a procedure for patulin in juices.
3. Spectroanalytical parameters for fusarium toxins.
4. Compendium of limits and regulations for mycotoxins.
5. State of knowledge and analysis of natural toxins in foods.

In addition, eleven additional projects were agreed to in principle and are under development; two in the area of nitrosamine analysis, two in the aquatic biotoxin area, one in the mycotoxin area, three on food additive problems and three relating to animal drugs.

During the past year the Commission sponsored a highly successful symposium on mycotoxins and



Some members of the Commission on Food Chemistry examining the intrinsic components of local foods at Ecully, Lyon.

phytoxins in Pretoria, South Africa, 22–25 July 1985. This was the 6th such symposium sponsored by the Commission. The groundwork has been laid for the 7th in this series to be held in Tokyo, Japan in 1988.

In addition, during 1985 the Commission activated four additional projects which will continue during the coming year:

1. Determination of sodium and potassium in biological materials and foods.
2. Determination of selenium in foods and biological materials.
3. Chromatographic separation of chlorinated dibenzo-p-dioxins and furan isomers.
4. Evaluation of PCB in foods and other biological samples.

A Titular Member has been designated 'Project Candidate' to develop and monitor these Commission projects properly.

The next meeting will be held in Zürich, Switzerland, 20–22 October 1986 in conjunction with the Eurofood Tox II meeting, 15–18 October; the Commission has proposed to co-sponsor an interdisciplinary conference at this meeting on Natural Toxins and Mutagenicity of Food.

A. E. Pohland

HPLC assumes a major role in projects

The high level of interest in and support for the activities of the Commission on Oils, Fats and Derivatives (VI.3) was clearly demonstrated by the presence of 42 delegates from 19 countries when it met in Lyon, 1–3 September 1985. Nine international and standards organizations were represented.

Excellent progress towards the completion of a number of the Commission's projects was reported with new methods for the determination of mono- and diglyceride-based emulsifiers and the determination of the thiobarbituric acid value. The texts of the procedures and the reports of the collaborative studies undertaken for their develop-

ment are now being prepared for publication in *PAC*.

A feature in the analytical work being undertaken by the working groups is the role of high performance liquid chromatography (HPLC). This technique is now being applied to the determination of tocopherols and tocotrienols in vegetable fats and oils and in new projects to develop standard methods for the determination of:

(a) triglycerides, by reversed phase HPLC, according to their equivalent carbon number (ECL). This will greatly assist in the detection of the adulteration of olive oil by semi-drying oils (a more sensitive method than the one presently in use is urgently required by the International Olive Oil Council).

(b) polymerized triglycerides by gel-permeation HPLC. This project represents an approach to the detection of the adulteration of fresh edible oils and fats (for either human or animal consumption) by heated (used) oils.

It was agreed in principle that the Commission would consider adopting methods published by other standards organizations. *Ad-hoc* groups were set up to consider the adoption of the AOAC (Association of Official Analytical Chemists) methods for the determination of antioxidants by HPLC and trans fatty acids by GLC.

The Commission has been requested to consider the extension of the scope of its standard method for the determination of fatty acids by GLC to allow for analysis using capillary columns. It was agreed to expand the terms of reference of the working group which is developing a capillary column GLC method for the determination of w3 and w6 polyunsaturated fatty acids in dietary oils and fats so that the method to be developed will be applicable to the complete fatty acid profile of the component triglycerides.

Considerable progress has been made in the development of guidelines for the conducting of the Commission's collaborative studies. Subject to minor editorial corrections and additions, the draft



considered at the meeting has been provisionally adopted pending the anticipated finalization of an official IUPAC/ISO (International Organization for Standardization)/AOAC at the 34th IUPAC General Assembly in 1987. Agreement regarding the best model for such studies in respect of the number of samples and the number of determinations to be carried out was not reached and in the meantime the coordinators of the working groups will be free,

Need for standardization of terms identified

At the meeting of the Atmospheric Chemistry Commission (VI.4) held at the General Assembly in Lyon the Chairman welcomed new Titular and Associate members and outlined their responsibilities within the IUPAC framework. He impressed on the Commission the importance of having interactive members particularly in relation to attending meetings and participating in the projects. He felt that there was now a good balance of membership expertise to cover and develop the principle subjects to be tackled, namely tropospheric, ambient and workplace atmospheres.

The project proposals were discussed at length. The inventory of current tropospheric chemistry programmes worldwide (project I) had already been initiated. It was felt important to develop an effective database of information on the programmes from each country. This should include lists of workers, compounds studied, locations, and methodology for example. One particular point related to the consistency of units and definitions of terms commonly used. Discussion of this point led to the formulation of a new project proposal on a glossary of terms for use by countries, particularly for the benefit of those entering the field for the first time.

The Commission also felt that it should not restrict itself to discussion of current research programmes but should use the information obtained and its own expertise to identify or predict future trends and developments in atmospheric chemistry and put forward recommendations for new research studies.

A number of feasibility studies were also identified during the course of the meeting. These related to the application of diffusive sampler systems for environmental measurement, the potential health effects of indoor air pollution and the transportation and deposition of pesticide aerosols. In the latter case close liaison with the

subject to the recommendations in the guidelines, to decide on the exact model for the collaborative studies they organize.

Following the conclusion of the meeting the manuscript for the 7th edition of the Commission's "Standard Methods for the Analysis of Oils, Fats and Derivatives" was handed to the representative of the publisher (Blackwell Scientific Publications Ltd). Publication is expected in 1986 and the new edition will include all the methods published in *PAC* since the 6th edition appeared in 1979. It will be in loose-leaf format and supplements will be published as required.

The next meeting will be held in Vienna, Austria, 2–4 September 1986.

W. D. Pocklington

Pesticide Chemistry Commission was anticipated.

The Commission will meet next in London, UK, on 4–5 September 1986.

C. J. Purnell

Pesticides in ground water

When the Commission on Pesticide Chemistry (VI.5) met at the General Assembly in Lyon last year its main work centred on its major projects and news projects proposals. It also reviewed progress in the organization of the VIth International Congress of Pesticide Chemistry to be held in Ottawa, Canada, 1986.

Detailed discussions were held on a draft paper on "Potential contamination of ground water by pesticides" with a view to producing a final draft for publication in 1986. This topic is of considerable interest and concern and the IUPAC paper will serve as a technical assessment of the situation for use by various national and international bodies. As most work had taken place in the USA, Dr S. Cohen of the Environmental Protection Agency (EPA) joined the Commission to work on this project. Other projects close to publication are "Multi-residue methods" and "Animal metabolism in relation to man". The multi-residue method project is of particular importance in analysis of samples from monitoring studies, the samples having unknown origins. The human metabolism topic aims to place mammalian metabolism studies in context and assesses their relevance when considering the fate of pesticides in humans. Other projects are at an earlier stage and several new exploratory papers were commissioned.

The Pesticide Chemistry Commission is responsible for arranging the series of International Congresses of Pesticide Chemistry. These are held

every four years. As the next conference is in 1986, Dr R. Greenhalgh (Chairman of the Scientific Programme Committee) gave a report on the arrangements.

The next meeting will be held in Canada, 4–8 August 1986.

T. R. Roberts

Quantities and units in clinical chemistry

One goal of the Commission on Quantities and Units in Clinical Chemistry (VII.2) is to provide the worldwide clinical chemistry (and clinical laboratory) community with recommendations and guidelines on quantities and units that conform to international standards in metrology. Within the scope of this goal, two Commission documents were recently published: "Nebulizer and flame properties in flame emission and absorption spectrometry" and "Names, symbols, definitions and units of quantities in optical spectroscopy". The latter was prepared jointly with Commission I.5. Along the same lines, the Commission is preparing a glossary of terms on quantities and units in clinical chemistry. At its meeting in Lyon, 30 August–1 September 1985, the Commission reviewed a draft document that lists and defines approximately 200 of the metrological terms used in clinical laboratory work, not only in the analytical component but also in the laboratory reports sent to clinicians.

At present, increasing use is made in clinical chemistry of the "timed" test. In this test a quantity determined on a patient specimen is used as a reference to monitor response to treatment. This provides a means of determining a patient's absorption/uptake/excretion of therapeutic agents or compliance to drug therapy. It is also used as a diagnostic test, where a physiological system is stimulated or suppressed and the reaction is monitored over a time interval. The Commission reviewed the draft of a document that outlines the basic principles necessary to define the quantities used for "timed" tests, and then proposed a format for naming such quantities, including if necessary the process causing the change (e.g. transport, diffusion, flow), and their units. It is hoped that this will provide the basis for clear and unambiguous utilization of this kind of data for patient care. The Commission decided that this general recommendation will be followed by recommendations on specific topics, such as clearance, stimulation tests, and therapeutic monitoring tests.

The clinical laboratory scientist today is confronted with a wide array of analytical techniques and associated instrumentation that utilize "protein binding" as one step in the analytical process. The

Commission is working on a project designed to provide a framework for a systematic classification for such assays, based on the principles of the analytical process, the assay design, the components, the dimensions and the specificity of the assay system, and on the clinical use of the results determined by the assay. A draft manuscript of a paper that outlines the factors that must be considered for such assay systems was reviewed at the Lyon meeting. It was agreed that this should be published as a resource/background paper to a recommendation that will list all the factors, quantities and units that are essential for a complete and unambiguous description of the different assay systems. Subsequent to the general recommendation on protein binding assays, specific proposals for individual assay systems (e.g. immunoassays, receptor assays) will be drawn up. These will contain only the factors considered essential for the particular assay system. Ultimately, the outcome of the "International Units" that are used in reporting quantitative determinations of components such as β HCG, TSH, IgE, insulin, and so on by this general analytical technique.

The Commission is also aiming to bring to the attention of the international standards organizations in metrology problems that are encountered by clinical chemists in their work. One question that has been under discussion by the Commission is that of a unit for the quantity "number (of entities)" or "counts" when used, for example, in number of cells in the blood, number of cell surface receptors in an aliquot of tissue homogenate, number of bacteria/viruses in a body fluid, and, in the rapidly developing biotechnological techniques; the number of bases in a segment of DNA. Because this quantity is said to be dimensionless, the unit for quantity is stated by the International Organization for Standardization (ISO) to be "one". This creates confusion, particularly amongst non-metrology specialists, because of the difficulty in distinguishing between the number "one" and the unit "one". As a result, there is inconsistency in the unit used for this quantity in the clinical laboratory report. The Commission agreed to prepare a proposal for a special unit for this quantity, to be submitted for IUPAC approval, through IDCNS, and subsequently to the Consultative Committee on Units of the General Conference of Weights and Measures.

The nomenclature of derived quantities is another area where there is a lack of consistency in current usage. Thus, for example, the terms density and specific gravity have different meanings when used in different specialities of chemistry. The Commission has published its solution to this problem "Nomenclature of Derived Quantities" (see *CI*, 1985, Vol. 7, No. 3, pp. 29–33). After allowing for a period of comment, it was agreed

that a request would be made to IUPAC, through IDCNS, to support the submission of this proposed terminology to Technical Committee 12 (Nomenclature) of the ISO, for its consideration and incorporation into the next revision of ISO Standard 31/0 — General Principles Concerning Quantities, Units and Symbols.

The Commission is also concerned with educational programmes aimed at helping clinical chemists and others in the health care community to learn and understand the quantities and units they are using. It was agreed to prepare proposals for workshops on quantities and units (particularly SI units) for health care professionals, especially in countries where the 1979 IUPAC/International Federation of Clinical Chemists (IFCC) recommendations on this subject have not been imple-

mented. It was also decided to prepare a proposal to plan and coordinate symposia at clinical chemistry congresses on more specific topics in quantities and units, for example biological standards and international units, and perhaps to prepare manuals for teaching quantities and units to clinical laboratory personnel. A self-instructional computer programme on quantities, their dimensions, and units was demonstrated and its possible applications reviewed.

The next meeting will be held in Rungstedgaard, Denmark, May 1986 during the 2nd IFCC Conference and a further meeting will be held in Seville, Spain, September 1986, in conjunction with the 3rd African, Mediterranean and Near East Congress of Clinical Chemistry.

H. P. Lehmann

Provisional Recommendations

IUPAC seeks your comments

In this section we publish synopses of IUPAC's latest provisional recommendations on nomenclature and symbols. All comments on these recommendations are welcome and will be taken into consideration. The final revised versions are published in *Pure and Applied Chemistry* and synopses of these published in *CI* as recent reports.

Nomenclature of inorganic chemistry (The Red Book): Revision of 2nd Edition (1970). Chapter 1–2: Grammar

"The purpose of this chapter is to guide the users of nomenclature in building the name or formula of an inorganic compound and to help them verify that the derived name or formula fully obeys the accepted rules". These words are stated at the introduction of this chapter which is a completely new part with respect to the 2nd edn. (1970). The words clearly express the substance of information thought necessary to include in this once the general aims and methods of nomenclature have been expounded in the first chapter.

Chemical nomenclature is indeed a very particular language with its words, its syntax and its grammar. This chapter contains a general survey of the "grammatical" rules governing the correct use of the various devices which enter in the construction of a name or a formula. It is divided into 17 sections. Sections 1 to 14 deal with idiomatic symbols (brackets, dots, commas, hyphens, dashes, etc.), Greek letters and numerals with many examples provided. The various priorities are then discussed in section 15. The last part deals with affixes (prefixes, infixes and suffixes) commonly used in inorganic nomenclature. These with

the numerical prefixes are presented in tables.

Comments on these recommendations are welcome and should be sent by 31 December 1986 to the Commission Secretary, Dr E. Samuel, Laboratoire de Chimie Organique Industrielle, Ecole Nationale Supérieure de Chimie, 11 rue Pierre et Marie Curie, F-75231 Paris Cédex 05, France.

Nomenclature of inorganic chemistry, Revised Edn. Chapter 1–6: Solids

The document deals with names of solid phases, chemical composition, point defect notation, phase nomenclature, non-stoichiometric phases, polymorphism, amorphous systems and glasses. This chapter has been rewritten completely and differs considerably from the 2nd edn. (1970) of *Nomenclature of Inorganic Chemistry* (The Red Book).

The point defect notation is based on the Kröger-Vink system. It allows the indication of site occupation by using the element symbols as subscripts. Vacant positions are indicated with 'V', interstitials with subscript 'i'. Charges are expressed by superscripts; both formal and effective charges can be used.

Phase nomenclature is derived from the Pearson notation. In the section on non-stoichiometric phases, descriptions are given of modulated structures, crystallographic shear structures, chemical twinning, infinitely adaptive structures and intercalates.

Addresses of National/Regional Centres

If you would like to comment on the provisional recommendations please write to your nearest national/regional centre requesting a copy of the full report. Copies are not available from the Secretariat. The most up-to-date list of national/regional centres is shown below.

Argentina

Dr J. M. Barnett, Asociación Química Argentina, Sánchez de Bustamante 1749, Buenos Aires, Argentina.

Asia (Australia, Bangladesh, Hong Kong, Indonesia, Iraq, Korea, Malaysia, Nepal, Philippines, Singapore, Sri Lanka, Thailand)

Prof Huang Hsing Hua, Chemistry Department, National University of Singapore, Kent Ridge, Singapore 0511.

Bulgaria

Prof. O. Peshev, Bulgarian Academy for Sciences, Centre for Chemistry, Academician G. Bonchev Street, Building 11, 1040 Sofia, Bulgaria.

Canada

Prof. J. ApSimon, Department of Chemistry, Carleton University, Ottawa, Ontario K1S 5B6, Canada.

China

Prof Cui Meng-Yuan, Chinese Chemical Society, POB 2709, Beijing, China.
Prof F. C. Chen, Department of Chemistry, National Taiwan University, POB 30-373, Taipei 107, Taiwan.

Czechoslovakia

Dr Karel Bláha, Czechoslovak Chemical Society, Hradcanské nám. 12, 118 29 Prague 1, Czechoslovakia.

France

Prof Y. Jeannin, Comité National de la Chimie, 28 rue Saint-Dominique, F-75007 Paris, France.

FRG, Austria and Switzerland

Prof H. Grünwald, c/o Verlag Chemie GmbH, Postfach 1260/1280, Pappelallee 3, D-6940 Weinheim, Federal Republic of Germany.

Hungary

Prof E. Pungor, Altalános és Analitikai Kémiai Tanszék, Budapesti Műszaki Egyetem, Gellért tér 4, H-1521 Budapest XI, Hungary.

India

Mr A. K. Bose, Indian National Science Academy, Bahadur Shah Zafar Marg, New Delhi-110002, India.

Italy

Prof F. Rallo, c/o Società Chimica Italiana, 48 Via le Liegi, 1-00198 Roma, Italy.

Japan

Dr H. Hamada, Executive Director, Chemical Society of Japan, 1-5 Kanda Surugadai, Chiyoda-ku, Tokyo, 101 Japan.

Netherlands

Ir E. J. de Ryck van der Gracht, Koninklijke Nederlandse Chemische Vereniging, Postbus 90613, 2509 LP Den Haag, Netherlands.

Scandinavia

Dr K. Samuelsson, Tjänstedata, S-105 32, Stockholm, Sweden.

South Africa

Dr J. R. Bull, Organic Chemistry Division, National Chemical Research Laboratory, POB 395, Pretoria 0001, Republic of South Africa.

UK

Dr A. McNaught, Royal Society of Chemistry, Burlington House, Piccadilly, London W1V 0BN, UK.

USA

Dr Marianne Brogan, Journals Department, American Chemical Society, 2540 Olentangy River Road, POB 3330, Columbus, Ohio 43210, USA.

USSR

Prof G. B. Bokij, Commission on Nomenclature, National Committee of Soviet Chemists, Academy of Sciences of USSR, Kosygin Street 4, SU-117977 Moscow V-334, USSR.

If you are not within the jurisdiction of any of these centres, please write to: Dr K. L. Loening, Chemical Abstracts Service, POB 3012, Columbus, Ohio 43210, USA.

For the distinction between polymorphs, indication of the crystal system in combination with the name or formula is recommended. Some abbreviations to designate amorphous systems and glasses are given.

Comments on these recommendations are welcome and should be sent by 31 December 1986 to Prof. R. Metselaar, Laboratorium voor Fysische Chemie, Technische Hogeschool Eindhoven, Postbus 513, NL-5600 MB Eindhoven, Netherlands.

Definitions of basic terms relating to individual macromolecules, their assemblies, and dilute polymer solutions

This important new document provides definitions for nearly two hundred basic terms dealing with such key areas of polymer physical chemistry as

molecular weight, molecular-weight averages, molecular-weight distributions, the radius of gyration, the theta state, the Flory-Huggins theory, the bead-spring model, draining, sedimentation, viscosity of dilute polymer solutions, scattering of radiation by polymers, and fractionation.

Among the innovations in these definitions is the proposed use of the terms "uniform polymer" and "non-uniform polymer" to denote polymers composed of molecules that are uniform or non-uniform, respectively, with respect to relative molecular mass and constitution. These new terms are recommended as substitutes for the widely used, but non-descriptive and self-contradictory terms "monodisperse polymer" and "polydisperse polymer."

Comments on these recommendations are welcome and should be sent before 31 December 1986 to Dr Norbert M. Bikales, Polymers Program, National Science Foundation, Washington, DC 20550, USA.

IUPAC Publications

Standard Potentials in Aqueous Solution

Standard electrode potentials (variously called redox potentials, oxidation-reduction potentials, etc.) are widely used by the scientific community because they provide predictive power about the course of chemical reactions and the behaviour of metal/solution interfaces. They represent crucial reference data for diversified disciplines, ranging from the physical sciences to geology, oceanography and biology. Thus, standard potentials are of general interest to all practicing chemists and of special relevance in such widely disparate areas as

corrosion research, biochemistry, chemical engineering, physical chemistry, analytical chemistry, electrochemistry, and inorganic synthesis. The need for a reliable compilation has been admirably filled by the classic monograph of Wendell M. Latimer, *Oxidation Potentials* (or *The Oxidation States of the Elements and Their Potentials in Aqueous Solutions*) first published in 1938 and last revised in 1952. Although this widely used work was later supplemented by numerous other compilations, Latimer has remained the authoritative reference in this field. A desire to incorporate a wealth of new data and to bring notations and conventions into accord with current usage led Commissions I.3 (Electrochemistry) and V.5



President W. G. Schneider with the editors of *Standard Potentials in Aqueous Solution* at the champagne launch of the book in Lyon (see also p. 21 of this issue and *CI*, Vol. 8, No. 1, p. 28, 1986).

(Electroanalytical Chemistry) to undertake the preparation of this book.

Latimer had admirable features of consistency throughout the book. This is an unmatched advantage of single authorship. However, Latimer himself recognized the corollary limitation: "Much . . . should have been recalculated by modern methods *but the labor involved is beyond the capacity of a single author*" (quoted from the Preface of the first edition, Prentice-Hall, Inc., New York, 1938; emphasis added). That constraint has since become genuinely insurmountable: no single individual could currently undertake such a Herculean task. In view of this situation the editors have opted for multiple authorship. Chapters were prepared by knowledgeable specialized experts and reviewed by referees whose names are included in this book. They hope that the potentials given here represent the *critically selected* values or at least the best estimates now available. To keep this book to a manageable size, discretion was exercised as to which half-reactions would be included for a given

element. For similar reasons, data have been limited to a single temperature, 25°C. Furthermore, no attempt was made to give complete citations to all pertinent original publications. The bibliography has been restricted to previous important compilations and "key papers." This monograph is intended as a convenient aid to the reader and the bibliography is *not* meant to be a pantheon of all contributions in the field.

The first two chapters of the book deal with units, conventions, methods of determination, and the concept of the single electrode potential. These are followed by standard potentials and thermodynamic data for the elements grouped according to their positions in the periodic table.

The book was launched at the IUPAC General Assembly in Lyon, France in September 1985 (see CI, Vol. 8, No. 1, p. 28, 1986). It is edited by A. J. Bard, R. Parsons and J. Jordan. Marcel Dekker, Inc. New York (1985) 824pp. US-\$29.95, ISBN 0 8247 7291 1.

Recent Reports

In this section we publish summaries of the most recent IUPAC Recommendations on Nomenclature and Symbols and Technical Reports. The full texts of these recommendations and reports are published in *PAC*.

Interphases in systems of conducting phases (Recommendations 1985)

The document is an Appendix to the Manual of Symbols and Terminology for Physicochemical Quantities and Units. Together with the other appendices notably that on Electrochemical Nomenclature, it expands the recommendations for nomenclature in the region of interphases containing charged particles. After suggesting terms for the description of the interphase itself, there are sections outlining nomenclature for electric potentials at free surfaces (a condensed phase in contact with vacuum or dilute gas) and in interphases (the boundary between two dense phases). These include a discussion of the electronic work function and the Volta (or contact) potential difference. Interphases between metals, semiconductors and electrolytes are discussed. Nomenclature for the thermodynamic properties of the interphase at equilibrium is recommended including capacitances and components of charge. Quantities related to the description of the structure of the interphase are discussed and terms consistent with the present knowledge of this structure are recommended for the situations of

the adsorption of ions or molecules and the possibility of partial charge transfer. Some general remarks are made about adsorption isotherms. The report concludes with some recommendations for the nomenclature of the mechanical properties of solid surfaces.

This report was prepared by the Commission on Electrochemistry (I.3) and was published in PAC, Vol. 58, No. 3, pp. 437–454 (1986).

Characterization of commercially available PAN (polyacrylonitrile)-based carbon fibres

The characterization of high-performance PAN-based carbon fibres is described. The process of conversion of polyacrylonitrile fibres into carbon fibres consists mainly of two sequent steps, namely stabilization and carbonization. The ladder structure consisting of acridone ring (40%), naphthyridine ring (30%) and hydronaphthyridine ring (20%) as shown in Fig. 5 was assigned for the chemical structure of fully stabilized fibres. Structure characterization of carbon fibres was carried out by the use of the techniques such as scanning electron microscopy, transmission electron microscopy, electron diffraction and electron energy loss spectroscopy. Surfaces of carbon fibres and also the interface between the surface and the matrix plastics were studied utilizing various kinds of surface and microanalytical techniques. XPS has proven to be effective in obtaining useful informa-

tions. The use of additional techniques such as Raman microprobe, FT-IR, solid state high-resolution NMR and secondary ion mass spectrometry are described. The characteristic features of carbon fibres are high tensile modulus and high tensile strength combined with low specific gravity. The following items about mechanical properties of carbon fibres are discussed: multifilament tensile test which is useful for measuring tensile strength distribution of single filaments, relation between tensile strength of filaments and structural parameters, and relation between tensile strength of filaments in air and those within composites.

This report was prepared by the Commission on Polymer Characterization and Properties (IV.2) and was published in PAC, Vol. 58, No. 3, pp. 455–468, (1986).

Definition and determination of response time of ion selective electrodes

One of the critical limiting factors in the use of ion-selective membrane electrodes, especially in routine analysis, is their so-called response time. The activity step method is the most important

technique for determining practical response time data. Applying the activity step method the measured overall response time data are determined not only by the properties of the ion-selective electrode but also by the design of the electrochemical cell, the measuring technique, the experimental conditions selected, and by the time-dependence of other sources of potential in the cell such as diffusion and streaming potential. The relation between the response time of the indicator electrode and that of the other parts of the whole system determine which of the theoretical equations may be applied to describe the transient signals. If one of the theoretical equations can be fitted to the experimental curves with the required accuracy the response time data can be intercompared. However when the mathematical equation describing the transient function of the cell is not known the internationally accepted definitions of response time are of not much practical value. Several problems of the early definitions of response time can be overcome by defining it as a time interval necessary to reach a predetermined slope/differential quotient $t(\Delta E/\Delta t)$ value on the potential–time curves.

This report was prepared by the Commission on Electroanalytical Chemistry (V.5) and was published in PAC, Vol. 58, No. 3, pp. 469–479, (1986).

PAC Review

Organic ferromagnets

Most organic compounds are diamagnetic since the ground electronic state of their molecules is a singlet. However, a number of organic radicals have a doublet ground state and are thus paramagnetic. Organic molecules with a ground triplet state or higher spin multiplicity are limited. They are classified into three groups: (1) anti-aromatic annulenes, (2) non-Kekulé structures, and (3) monocentric diradicals. It is these structures which are expected to function as models for hitherto unknown organic ferromagnets. Hiizu Iwamura and colleagues at the Institute for Molecular Science, Okazaki, Japan have been working on the design, generation and analysis of a series of high-spin polycarbenes which may serve as models for organic ferromagnets. Their work is reviewed in a paper presented at the 5th International Symposium on Novel Aromatic Compounds held at the University of St Andrews, Scotland, UK, 15–19 July 1985. Invited lectures presented at this symposium are published in the January 1986 issue of *PAC* (Vol. 58, No. 1). The paper by Hiizu Iwamura appears on pp. 187–196 of this issue.

Mould and fungi

Algal and fungal toxins comprise a wide array of naturally occurring toxic compounds in the aquatic and terrestrial environment. An association between these microbial toxins and human health has existed since biblical times when ergotism* was assumed to be a toxicosis that resulted from the ingestion of such natural toxins. During recent decades the existence and significance of these intoxications have been recognized and the chemical features and molecular mechanisms of their toxic action, in particular, have been elucidated. The toxicological behaviour of mycotoxins and phycotoxins is reviewed in a paper entitled "Toxicology of microbial toxins" presented by Yoshio Ueno (University of Science, Tokyo, Japan) at the 6th International Symposium on Mycotoxins and Phycotoxins held in Pretoria, Republic of South Africa, 22–25 July 1985 (*PAC*, 1986, Vol. 58, No. 2, pp. 339–350).

Other plenary lectures presented at this symposium

**Ergotism* is a condition characterized by gangrene or by degenerative changes in the nervous system. It is caused by eating cereal grains infected by the ergot fungus.

sium and published in the February 1986 issue of *PAC* include "Regulation of secondary metabolism in fungi" by A. L. Demain (USA), "Recent studies on mould metabolites" by C. Tamm (Switzerland) and "Biochemical mechanism of action of mycotoxins" by K-H. Kiessling (Sweden).

Chemical defence in sponges

A great number of marine invertebrates produce or sequester bioactive secondary metabolites. Most of these compounds serve to discourage attack of mobile predators, to kill potential fouling or contaminating organisms, or perhaps to prevent competitors from intruding into the living space of sessile species. The defensive role of only a few of these secondary metabolites has been demonstrated. Considering the great number of indexed species of marine invertebrates (about 200 000), only a small fraction of them has been examined until now for their ability to produce or sequester defensive compounds, and some classes of organisms have been studied more intensively than others.

Sponges (phylum *Porifera*) are primitive multicellular invertebrates which contribute significantly to the biomass of the marine ecosystems. They have a worldwide distribution and are found in a great diversity of habitats. It is generally

assumed that this persistent ecological success is due, not only to well adapted and adaptable reproductive and physiological strategies, but also to effective defence mechanisms.

These defence mechanisms are reviewed in a paper by J. C. Braekman and D. Dalose (Université Libre de Bruxelles, Belgium) which was presented as a plenary lecture at the 5th International Symposium on Marine Natural Products held in Paris, 2–6 September 1985. The plenary lectures from this symposium are published in the March 1986 issue of *PAC* (Vol. 58, No. 3).

Specific examples of the chemical defences of sponges (and echinoderms — particularly the sea cucumbers) were also presented in a paper by V. A. Stonik (Pacific Institute of Bioorganic Chemistry, USSR) entitled "Some Terpenoid and steroid derivatives from echinoderms and sponges" (pp. 423–436).

In another paper on sponge chemistry G. R. Pettit *et al.* (Arizona State University, USA) reported that the yellow sponge *Lissodendoryx isodictyalis* was found to yield a series of closely related substances very active against the murine P388 lymphocytic leukemia (pp. 415–421). Recent efforts to isolate and identify marine natural products with potential value as pharmaceutical or agrochemical agents were reviewed (pp. 365–374) by J. H. Cardellina II (Montana State University, USA).

Newsletters & Bulletins

International Union of Food Science and Technology (IUFoST)

IUFoST Newsletter, No. 13, December 1985. This contains news about IUFoST meetings and forthcoming international congresses on food science and technology.



International Association for Cereal Science and Technology (ICC)

ICC Newsletter, No. 6, February 1986. This issue includes an article entitled "Thirty years on international cooperation in cereal science and technology" by the Secretary-General of ICC. There is also a report of a working group on "Information — Documentation" in the fields (!) of cereal science and technology.

International Council of Scientific Unions (ICSU)

ICSU Newsletter No. 24, December 1985. This issue includes reports on the International Geosphere–Biosphere Programme: A Study of Global Change (IGBP-CG); Science and Technology in Developing Countries; International Assessment of the Role of Carbon Dioxide and of other Greenhouse Gases in Climate Variations and Associated Impact; International Biosciences Networks (IBN); Scientific Committee on Problems of the Environment (SCOPE) and, finally, the 23rd General Conference of UNESCO.

ICSU Committee on Data for Science and Technology (CODATA)

CODATA Bulletin, No. 58, November 1985. This issue is entitled "Thermodynamic Databases". It contains selected papers from the First CODATA Symposium on Chemical Thermodynamic and

Thermophysical Properties Databases held in Paris, France, September 1985. **No. 59, December 1985** deals with thermophysical properties of some key solids. It is a report of the CODATA Task Group on Thermophysical Properties of Solids. The papers included in this report are concerned with heat capacity, thermal expansion, electrical resistivity, thermal conductivity, and absolute thermopower of Cu, Fe, Si, Pt, W, and/or Al_2O_3 .

International Information Centre for Terminology (Infoterm)

Biblioterm 16, December 1985 and 17, February 1986. These contain publication details of recent works or titles relevant to the field of terminology. Sections include "Multilingual Specialized Vocabularies" and "Science and Technology Dictionaries". There is also a section on "Acronyms, Initialisms and Abbreviations".

Infoterm Newsletter 39, January 1986. This contains news of meetings and publications on terminology.

Groupe pour l'Avancement des Méthodes Spectroscopiques et Physico-Chimiques d'Analyse (GAMS)

GAMS — Information Bulletin No. 93, November–December 1985 and No. 94, January–February 1986. These information bulletins are in French. They contain news of GAMS activities and various meetings and publications concerned with spectroscopic methods and physico-chemical methods of analysis.

Conferences

Euroanalysis

The Euroanalysis VI conference will be held in Paris, France, 7–11 September 1987. There will be special sessions on:

- The use and construction of analytical probes
- Applications and analytical methods for living environmental problems
- Analysis of solid state samples

There will also be a poster session on 'New methods of teaching analytical subjects'. Further information and pre-registration forms for this conference are available from GAMS, 88 boulevard Malesherbes, F-75008 Paris, France.

International Organization for Standardization (ISO)

ISO Bulletin No. 1, January 1986. This contains an article by the Secretary-General of ISO on standardization and a report on a workshop on electronic data processing (EDP). Another article on surgical implants reviews the various series of standards for basic items in bone surgery such as bone screws, pins and white as well as cardiac pacemakers. **No. 2, February 1986** contains an article on the standardization of bearings including ball and roller bearings. For flavour chemists there is a report of an International Standard giving general guidance on the methodology of sensory analysis to produce 'flavour profiles'. Both issues contain the usual sections on International Standards in process.

Environment Liaison Centre (ELC)

Ecoforum, No. 5, October 1985. This issue is devoted to the topic of water. It contains a major article entitled "Keeping an eye on global waters" which reviews the work of the United Nations Environment Programme (UNEP) and World Health Organization (WHO) Global Environmental Monitoring Programme (GEMS)/water project. **Issue No. 6, December 1985** is concerned with forests (both deforestation and afforestation). There is a major article on 'Importance of multi-lateral development banks in conserving forests'.

Ecoforum: News Alert, No. 5, December 1985. This is a "Bhopal Anniversary Special". The major heading in this ELC Supplement to Ecoforum is 'So, what after Bhopal?'

Photochemistry

The European Photochemistry Association (EPA) Summer School will be held at the Congress Centre "De Witte Raaf", Noordwijk, The Netherlands from September 7 to September 12 1986. The main topics are: Photochemistry as a tool in organic synthesis; Detection of short-lived intermediates in photochemistry; Photochemistry of organometallic compounds; Photochemistry and photophysics of synthetic polymers; Theoretical aspects of photochemistry; Detection and properties of biradicals in photoreactions; Aspects of photobiology. Further information is available from: Mrs R. Cremer-Michels, Department of Organic Chemistry, Gorlaeus Laboratories, University of Leiden, PO Box 9502, 2300 RA Leiden, The Netherlands.

New Drugs in Cancer Therapy

The Fifth NCI-EORTC Symposium on New Drugs in Cancer Therapy will be held at the Free University, Amsterdam, The Netherlands, 22–24 October 1986. NCI is the Netherlands National Cancer Institute and EORTC is the European Organization for Research and Treatment of Cancer. Further information and registration forms are available from: Fifth NCI-EORTC Symposium on New Drugs in Cancer Therapy, Congress Service — Free University, PO Box 7161, 1007 MC Amsterdam, The Netherlands.

Pollutants in the Unsaturated Zone

A workshop on "Pollutants in the Unsaturated Zone" will be held at Beit-Daga, Israel, March/April 1987. One day of the workshop will be devoted to inorganic pollutants, one day to organic pollutants and one day to phenomena common to both. The conference organizer is Dr J. Goldshmid (Water Chemistry Commission, VI.6), Environmental Engineering of Design Corporation Ltd, PO Box 43059, Tel Aviv, Israel.

Malaysian Congress

The Malaysian Institute of Chemistry is organizing its first Chemical Congress this year. The Congress will comprise six symposia:

1. Management of Industrial Wastes in Asia and the Pacific
2. Industrial Chemistry for Development
3. Advances in Analytical Instrumentation and their Application
4. Chemical Education
5. Polymers
6. Advances in the Chemistry and Technology of Oils and Fats

The first three of these are regional symposia.

The Congress will be held from 17–20 November 1986 in Kuala Lumpur. The official language will be English. Further details are available from: Organising Secretary, MA CHEM '86, c/o Rubber Research Institute of Malaysia, PO Box 10150, 50908 Kuala Lumpur, Malaysia.

IUPAC-Sponsored Conferences

Reduced fees for Affiliates attending IUPAC Sponsored Conferences

At the IUPAC General Assembly held in Lyon, France last year, Council endorsed a proposal to impose an extra condition on IUPAC sponsorship of conferences. This condition is now stated on the Advance Information Questionnaire (AIQ) which the Chairman or Secretary of the Local Organizing Committee of a Conference must complete in the application for sponsorship. The condition is 'IUPAC sponsorship requires that its Affiliate Members are entitled to a 10% reduction or 'own members' rate on the registration fee for scientific participants'.

IUPAC recommends that the AIQ is completed and submitted at least two years in advance of the actual meeting. For this reason all the conferences currently listed in the Conference Calendar (see pp. 36–38) were sponsored before the new condition was imposed. Earlier this year the Affiliate Affairs Secretary wrote to organizers of these conferences requesting that they grant the 10 percent reduction to Affiliates. Some conference organizers responded that it was too late to make the appropriate arrangements to allow this reduction. Others, however, were able to grant the reduction even though, in some cases, it was too late to include an announcement of the reduction in conference circulars or registration forms.

Affiliates who wish to avail themselves of the reduction in fees at these conferences should apply

in writing when submitting their registration forms. Conference organizers are asked to send a list of these Affiliates to the Affiliate Affairs Secretary at the IUPAC Secretariat in Oxford.

Reduced fees for Affiliates are available at the following conferences:

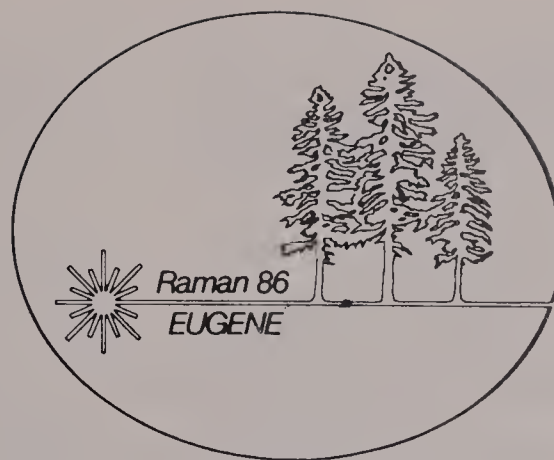
- International Conference on Bio- and Toxicokinetics of Metals (III COMTOX) (Kitakyushu, Japan, 27–31 July 1986)
- 10th International Conference on Non-Aqueous Solutions (Leuven, Belgium, 17–21 August 1986)
- 7th International Zeolite Conference (Tokyo, Japan, 17–22 August 1986)
- International Symposium on New Sensors and Methods for Environmental Characterization (SMEC) (Kyoto, Japan, 10–12 November 1986)
- 2nd International Symposium on Quantitative Luminescence Spectrometry in Biomedical Sciences (Ghent, Belgium, 11–14 May 1987)
- International Symposium on Free-Radical Polymerization: Kinetics and Mechanism (Genoa, Italy, 17–23 May 1987)
- 31st International Symposium on Macromolecules (Merseberg, GDR, 30 June–4 July 1987)
- 8th International Symposium on Solute-Solute-Solvent Interactions (Regensburg, FRG, 9–14 August 1987)

10th International Conference on Raman Spectroscopy *Eugene, Oregon, USA, 31 August–5 September 1986*

This conference will deal with all aspects of the theory, practice and applications of Raman spectroscopy in physics, chemistry, biology and applied areas. The programme will include invited talks, contributed lectures and poster sessions. The contributed presentations will be reviewed by members of a programme advisory committee. A manufacturers' equipment exhibition will include the latest in laser devices, monochromators, detection devices and other equipment used to perform Raman experiments.

Presentations will include invited talks, contributed lectures and poster sessions. Participants are encouraged to present posters in order to provide a more complete picture of current research. The official language of the conference will be English.

Accommodation will be available at the Univer-



sity of Oregon and at nearby motels and hotels. The Eugene Hilton is holding a block of rooms for conference attendees who require more amenities than those offered by the dormitories or motels.

Eugene is located in the heart of the Willamette Valley, approximately an hour and a half away from the Pacific Ocean to the west and the same distance from the Cascade mountains to the east. Possible side trips include river rafting and deep sea fishing. Excellent fly fishing streams and two year-round ski areas are also easily accessible.

11th International Symposium on Macrocyclic Chemistry *Florence, Italy, 1–4 September 1986*

The Symposium will be held in the "Speaker's Corner" Conference Center of Villa La Loggia, a villa which, for its architecture and history is one of the most illustrious and prestigious of the Florence area.

The aim of this Symposium is to provide a forum for the exposition and discussion of recent research in the chemistry of the macrocyclic compounds. Both theoretical and experimental aspects of the properties and behaviour of synthetic and naturally occurring macrocyclic compounds will be covered. Some of the selected topics are: synthesis

and structures, industrial applications, kinetics and thermodynamics, model systems and biological aspects, anion activation.

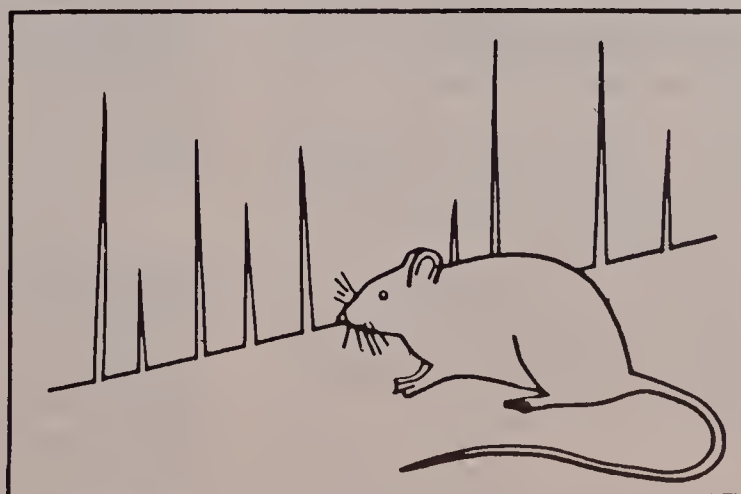
The planned scientific programme will include plenary and session lectures, as well as poster sessions.

The official language of the Symposium will be English. There will be no provision for translation.

Florence is well known not only for its history and for its artistic and cultural aspects, but also for its marvellous landscape and its entertainments.

Euro Food Tox II: Interdisciplinary Conference on Natural Toxicants in Food *Zürich, Switzerland, 15–18 October 1986*

This conference, which is sponsored by the European Society of Toxicology, the Federation of European Chemical Societies and IUPAC, will be held in the lecture-theatre "Häldeliweg" of the University of Zürich. The aim of the meeting is to facilitate the exchange of ideas on the toxicological aspects of food chemistry and analysis with a view to identifying relevant and productive lines for future research. The meeting is addressed to food



chemists and toxicologists in national and international government and research organizations, industry and universities. The main topics of the conference will be:

- goitrogens
- plant-oestrogens
- phytoalexins
- natural enzyme-inhibitors
- hydrazines
- flavonoids
- protein-pyrollysates
- other mutagenic compounds in food

The meeting will include provisions for contributed papers and posters. These will be published in book-form and will be available at the meeting. The cost will be included in the registration fee. The cost of the symposium will not exceed sFr. 200.—. A reduced rate of sFr. 50.— will apply to students upon recommendation of the head of department.

International Symposium on New Sensors and Methods for Environmental Characterization (SMEC) *Kyoto, Japan, 10–12 November 1986*

This symposium, which is sponsored by IUPAC, the Chemical Society of Japan, the Japan Society for Analytical Chemistry, Nissan Science Foundation and the Research Institute of Oceanochemistry, will be held at the KYOTO KAIKAN in Okazaki, Kyoto, Japan. The purpose of this symposium is to present results from:

- the development of new sensors for environmental analysis
- the development of trace analysis for the environment
- the environmental characterization using new technology

The symposium programme will consist of invited lectures and poster sessions with or without oral presentations. The symposium has three major themes:

- (1) Development of new sensors for environmental analysis
 - electrochemical methods
 - spectroscopic methods
 - magnetic methods
 - biochemical methods
 - other methods
- (2) Development of trace analysis for the environment
 - new analytical methods for trace elements
 - speciation for trace elements
- (3) Environmental characterization using new methodology
 - global environmental effects
 - continuous multi-elements monitoring
 - other methodology

The lectures and discussions will be presented in English or in other languages with the translation into English.

Conference Calendar

Conference circulars and registration forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in parentheses.

1986

Organic Chemistry in Technological Perspective

1–6 June. International Symposium on Organic Chemistry in Technological Perspective. Jerusalem, Israel.

(Symposium Secretariat, 1st International Symposium on Organic Chemistry in Technological Perspective, PO Box 50006, Tel-Aviv 61500, Israel.)

Ring-Opening Polymerization

22–26 June. 5th International Symposium on Ring-Opening Polymerization. Blois, France.

(ROP 86 Secretariat, Laboratoire de Chimie Macromoléculaire, Université Pierre et Marie Curie, LA 24 Tour 44 — 1er étage, 4 place Jussieu, 75230 Paris Cédex 05, France.)

Synthetic Polymeric Membranes

7–10 July. 29th Microsymposium on Macromolecules. Prague, Czechoslovakia.
(29th Microsymposium, P.M.M. Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 126 06 Prague 616, Czechoslovakia.)

Crosslinked Epoxides

14–17 July. 9th Discussion Conference on Macromolecules. Prague, Czechoslovakia.
(9th Discussion Conference, P.M.M. Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 126 06 Prague 616, Czechoslovakia.)

Chemical Thermodynamics

14–18 July. International Conference on Chemical Thermodynamics. Lisbon, Portugal.
(Dr J. A. Martinho Simões,

Complexo 1, Instituto Superior Técnico, Av. Rovisco Pais, 1096 Lisboa Codex, Portugal.)

Analytical Chemistry

20–26 July. SAC 86: International Conference on Analytical Chemistry. Bristol, UK. (Miss P. E. Hutchinson, Secretary of the Analytical Division, Royal Society of Chemistry, Burlington House, London W1V 0BN, UK.)

Chemical Toxicology and Clinical Chemistry of Metals

27–31 July. International Conference on Bio- and Toxicokinetics of Metals (III COMTOX). Kitakyushu, Japan. (Prof. Yasushi Kodama, Secretary General VIth UOEH International Symposium and IIIrd COMTOX, UNIV OEH SCH MED PO ORIO, Yahata Nishi Ku, Kitakyushu 807, Japan.)

Photochemistry

27 July–1 August. 11th International Symposium on Photochemistry. Lisbon, Portugal. (Prof. Dr Sílvia M. B. Costa, Centro de Química Estrutural, Complexo 1, Instituto Superior Técnico, Av. Rovisco Pais, 1096 Lisboa Codex, Portugal.)

Organic Synthesis

10–15 August. 6th International Conference on Organic Synthesis, Moscow, USSR. (6th ICOS Secretariat, N. D. Zelinsky Institute of Organic Chemistry, Academy of Sciences of USSR, Leninsky Prospect 47, SU-117913 Moscow B-334, USSR.)

Pesticide Chemistry

10–15 August. 6th International Pesticide Chemistry Congress, Ottawa, Canada. (Sixth International Congress of Pesticide Chemistry, c/o Chemical Institute of Canada, 151 Slater Street, Suite 906, Ottawa, Ontario, Canada K1P 5H3.)

Carbohydrates

10–16 August. 13th International Carbohydrate Symposium. Cornell University, Ithaca, New York, USA. (XIII International Carbohydrate Symposium, Conferences Servies, Box 3, Robert Purcell Union, Cornell University, Ithaca, New York 14853, USA).

Solubility Phenomena

12–15 August. 2nd International Symposium on Solubility Phenomena. Newark, New Jersey, USA. (Dr Mark Salomon, Co-chairman, Second International Symposium on Solubility Phenomena, PO Box 254, Fair Haven, New Jersey 07701, USA.)

Non-aqueous Solutions

17–21 August. 10th International Conference on Non-aqueous Solutions, Leuven, Belgium. (Dr G. Maes, Department of Chemistry, University of Leuven, Celestijnenlaan 200F, B-3030 Heverlee, Belgium.)

Zeolite Chemistry

17–22 August. 7th International Zeolite Conference. Tokyo, Japan. (Prof. Hiro-o Tominaga (7 IZC), Department of Synthetic Chemistry, Faculty of Engineering, The University of Tokyo, Hongo, Bunkyo-ku, Tokyo 113, Japan.)

Natural Products

17–22 August. 15th International Symposium on the Chemistry of Natural Products. The Hague, Netherlands. (Administrative Secretariat, 15th IUPAC International Symposium Natural Products, c/o Netherlands Congress Centre, PO Box 82000, 2508 EA The Hague, The Netherlands.)

Physical Organic Chemistry

24–29 August. 8th IUPAC Conference on Physical Organic Chemistry. Tokyo, Japan. (VIIth ICPOC, The Chemical Society of Japan, 1-5 Kanda-Surugadai, Chiyoda-ku, Tokyo 101, Japan.)

Coordination Chemistry

24–29 August. 24th International Conference on Coordination Chemistry. Athens, Greece. (XXIV International Conference on Coordination Chemistry, c/o Dr E. Vrachnou-Astra, Department of Chemistry, N.R.C. 'Demokritos', PO Box 60228, 153 10 Aghia Paraskevi, Athens, Greece.)

Raman Spectroscopy

31 August–5 September. 10th International Conference on Raman Spectroscopy. Eugene,

Oregon, USA. (Secretary, ICORS-X, Organizing Committee, Chemical Physics Institute, University of Oregon, Eugene, OR 97403, USA.)

Phosphorus Chemistry

31 August–6 September. International Symposium on Phosphorus Chemistry. Bonn, FRG. (Prof. Dr R. Appel, Chairman of the X ICPC, Anorg. Chem. Institut, Universität Bonn, Gerhard-Domagk-Str. 1, D-5300 Bonn 1, Federal Republic of Germany.)

Macrocyclic Chemistry

1–4 September. International Symposium on Macrocyclic Chemistry. Florence, Italy. (Prof. Mauro Micheloni (Secretary), Department of Chemistry — University of Florence, Via Maragliano, 75/77, I-50144 Florence, Italy.)

Phosphorus Chemistry

7–12 September. 2nd International Symposium on Phosphorus Chemistry Directed Toward Biology. Spala, near Lodź, Poland. (Prof. Dr W. J. Stec, Department of Bioorganic Chemistry, Centre of Molecular and Macromolecular Studies, Polish Academy of Sciences, PL-90 362 Lodź, Boczna 5, Poland.)

CHEMRAWN V

22–26 September. Current and Future Contributions of Chemistry to Health — The New Frontiers. Heidelberg, FRG. (Gesellschaft Deutscher Chemiker, Abteilung Tagungen, PO Box 90 04 40, D-6000 Frankfurt am Main, Federal Republic of Germany.)

Natural Toxicants/ Mutagenicity of Food

15–17 October. Interdisciplinary Conference (EURO FOOD TOX II). Zürich, Switzerland. (Dr R. Battaglia, Kent Laboratory, Postfach, CH-8030 Zürich, Switzerland.)

Environmental Characterization

10–12 November. International Symposium on New Sensors and Methods for Environmental Characterization. Kyoto, Japan.

(International Symposium SMEC, c/o Institute for Chemical Research, Kyoto University, Uji, Kyoto 611, Japan.)

1987

Quantitative Luminescence Spectrometry

11–14 May. 2nd International Symposium on Quantitative Luminescence Spectrometry in Biomedical Sciences. Ghent, Belgium.
(Dr Willy R. G. Baeyens, Laboratory of Pharmaceutical Chemistry and Drug Quality Control, Faculty of Pharmaceutical Sciences, State University of Ghent, Harelbekestraat 72, B-9000 Ghent, Belgium.)

CHEMRAWN VI

17–22 May. CHEMRAWN VI. World Conference on Advanced Materials Needed for Innovations — Energy, Transportation and Communications. Tokyo, Japan. (CHEMRAWN VI Coordinating Office, The Chemical Society of Japan, 1–5 Kanda-Surugadai, Chiyoda-ku, Tokyo 101, Japan.)

Free-Radical Polymerization

17–23 May. International Symposium on Free-Radical Polymerization: Kinetics and Mechanism. Santa Margherita Ligure, Nr. Genoa, Italy.
(Prof. Savgerio Russo, C.N.R. Center on Macromolecules, Corso Europa 30, I-16132 Genoa, Italy.)

Macromolecules

30 June–4 July. 31st International Symposium on Macromolecules. Merseburg, GDR.
(Technische Hochschule "Carl Schorlemmer", Leuna-Merseburg, Macro 87, Otto-Nuschke-Strasse, DDR-4200 Merseburg, German Democratic Republic.)

Macromolecules

6–9 July. 30th Microsymposium on Macromolecules. Polymer-Supported Organic Reagents and Catalysts. Prague, Czechoslovakia.

(Dr P. Čefelín, Scientific Secretary, P.M.M. Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovského náměstí 2, CS-16206 Prague 6-Petriny, Czechoslovakia.)

Macromolecules

13–16 July. 10th Discussion Conference on Macromolecules. Small-angle Scattering and Related Methods.
(Dr P. Čefelín, Scientific Secretary, P.M.M. Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovského náměstí 2, CS-16206 Prague 6-Petriny, Czechoslovakia.)

IUPAC Congress

13–18 July. 31st International Congress of Pure and Applied Chemistry. Sofia, Bulgaria.
(Secretariat, 31st IUPAC Congress, c/o Dr R. Vlahov, Institute of Organic Chemistry, Bulgarian Academy for Sciences, 1113 Sofia, Bulgaria.)

Heteroatom Chemistry

19–24 July. International Conference on Heteroatom Chemistry (ICHAC-1987). Ibaraki, Japan.
(Prof. Shigeru Oae, Department of Chemistry, Okayama University of Science, Ridai-cho, Okayama 700, Japan.)

Coordination Chemistry

26–31 July. 25th International Conference on Coordination Chemistry. Nanjing, China.
(Prof. Xiao-Zeng You, Conference Secretary, XXV ICC, Coordination Chemistry Institute, Nanjing University, Nanjing, Jiansu Province, China.)

Bioinorganic Chemistry

6–10 July. 3rd International Conference on Bioinorganic Chemistry. Noordwijkerhout, The Netherlands.
(Prof. Dr J. Reedijk, State

University Leiden, Gorleaus Laboratories, PO Box 9502, NL-2300 RA Leiden, The Netherlands.)

Solute–Solute–Solvent Interactions

9–14 August. 8th International Conference on Solute–Solute–Solvent Interactions. Regensburg, Federal Republic of Germany.
(Prof. Dr J. M. G. Barthel, Institut für Physikalische und Theoretische Chemie, Universität Regensburg, Universitätstrasse 31, D-8400 Regensburg, Federal Republic of Germany.)

Trace Elements

17–21 August. 2nd Nordic Symposium on Trace Elements in Human Health and Disease. Odense, Denmark.
(Prof. Philippe Grandjean, Department of Environmental Medicine, Institute of Community Health, Odense University, J. B. Winslows Vej 19, DK-5000 Odense C, Denmark.)

Fourier Transform Spectroscopy

24–28 August. 6th International Conference on Fourier Transform Spectroscopy. Vienna, Austria.
(6th FTS Conference 1987, c/o Interconvention, PO Box 80, A-1107 Vienna, Austria.)

1988

Natural Products

29 May–4 June. 16th International Symposium on the Chemistry of Natural Products. Kyoto, Japan.
(Prof. Sho Itô, Department of Chemistry, Faculty of Science, Tohoku University, Aramaki-aza-Aoba, Sendai 980, Japan.)

Macromolecules

1–6 August. 32nd International Symposium on Macromolecules. Kyoto, Japan.
(Prof. Takeo Saegusa, Department of Synthetic Chemistry, Faculty of Engineering, Kyoto University, Yoshida-machi, Sakyo-ku, Kyoto, 606 Japan.)

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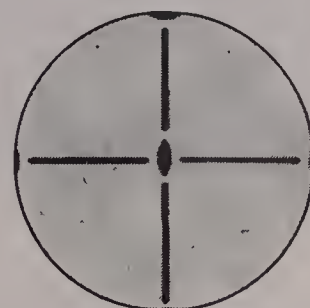
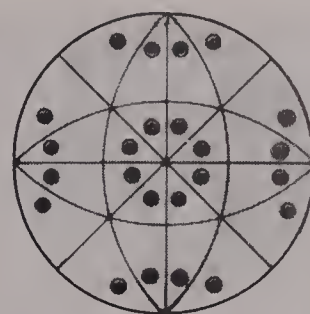
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The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary, non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.

Its objectives are:

- to promote continuing co-operation among the chemists of the member countries;
- to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
- to co-operate with other international organizations which deal with topics of a chemical nature;
- to contribute to the advancement of pure and applied chemistry in all its aspects.

The membership of IUPAC presently comprises 42 countries, each represented by a national organization, such as an academy of science or research council.

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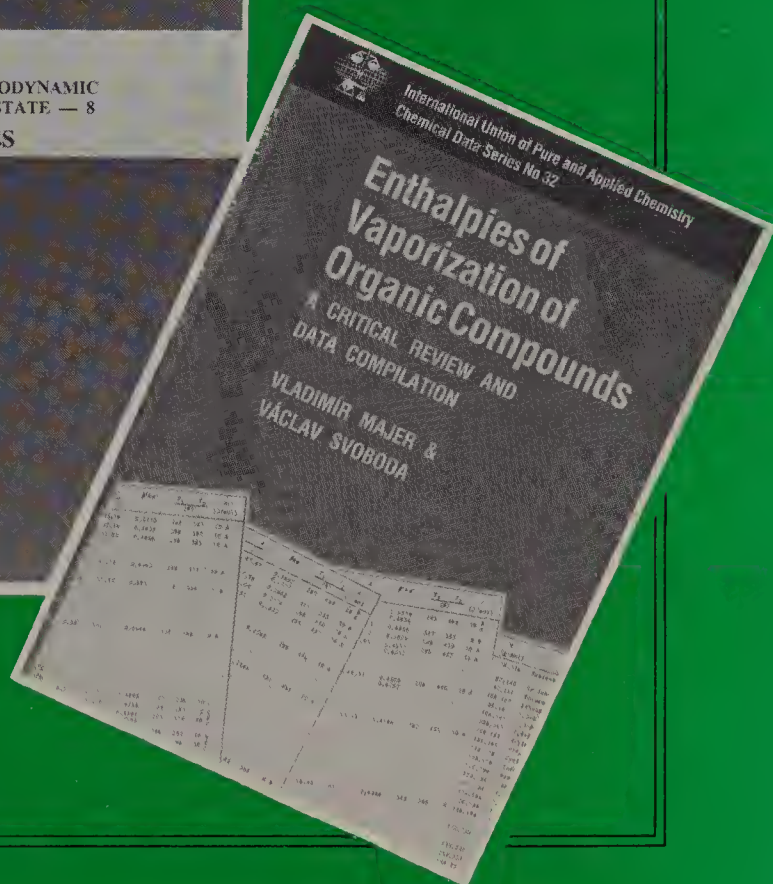
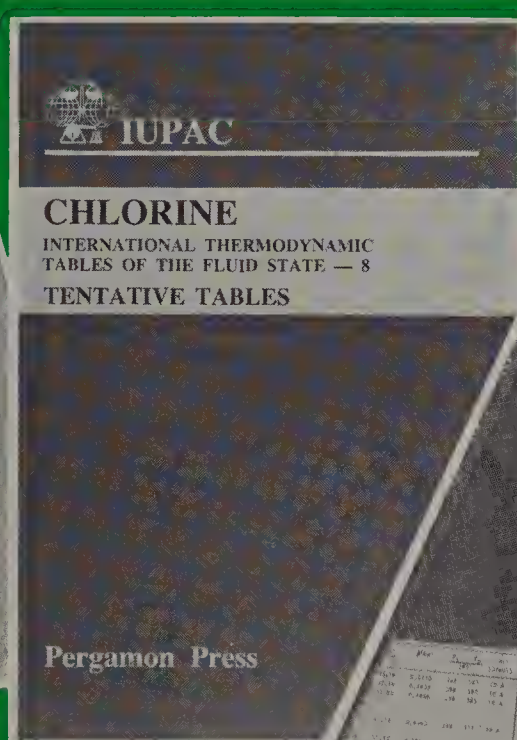
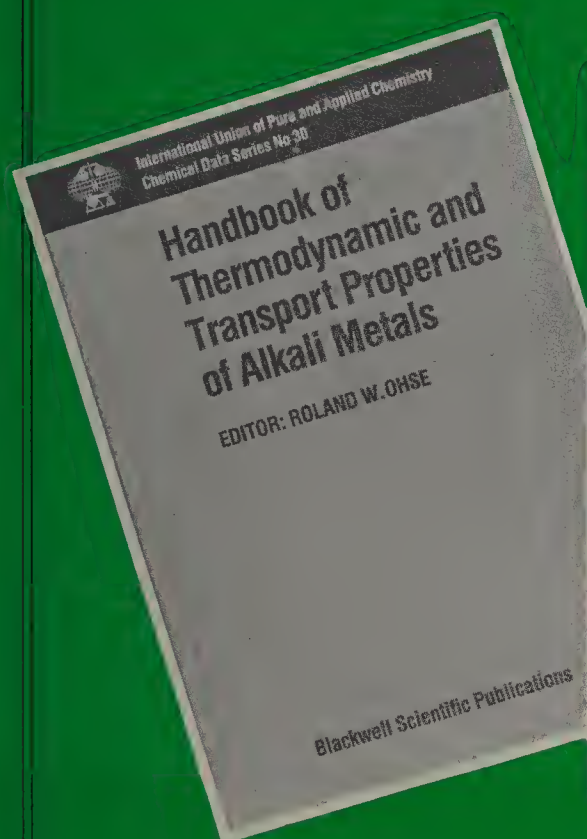


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Chemistry International

The news magazine of the International Union
of Pure and Applied Chemistry (IUPAC)



Chemical Data Series



1986, Vol 8, No 4 (August)

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Chemistry International

The news magazine of the International Union of Pure and Applied Chemistry (IUPAC)

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Reproduction of Articles

Reproduction or translation of articles in this issue is encouraged, provided that it is accompanied by a reference to the original publication in *Chemistry International*, unless there is a footnote to the contrary.

Heady times, these

"Transition metal organometallic chemistry is so exciting today — every new issue of our favorite journal brings news, from Novosibirsk or Mülheim or College Station, of a dozen new structures, twice as many reactions. Not only can we make molecules, and often see their structures, but we begin to understand the intricate, beautiful patterns in which they move, what is easy and difficult for them to do.

"Heady times, these. In such marvellous days, when knowledge comes easy and we are caught in the flux of discovery, it is easy to forget that there are other fields of inorganic chemistry, or even not chemistry at all, that deal in significant ways with transition metals and carbon. Let me name two such areas, and give examples of problems in them that are closely related to our enterprise.

"First there is solid state chemistry . . . Or take surface science . . ."

Rarely does one meet such enthusiasm in the pages of scientific journals. We are much more accustomed to

"Recently, we have been working to explore new possibilities in synthetic reactions based on the concept of 'Synthetic Control' . . ."

or

"For a number of years, our own research effort in this area was directed towards two objectives."

This style of scientific reporting tends to conceal rather than reveal the enthusiasm of the authors. Emotions must not cloud the facts. Chemists must remain objective and detached from their work — or at least in their written reports of it. How refreshing then to encounter enthusiasm in scientific writing.

All three of the above quotations are taken from the April 1986 issue of *Pure and Applied Chemistry (PAC)*. This issue contains the plenary and section lectures presented at the Twelfth International Conference on Organometallic Chemistry held in Vienna, Austria, 9–13 September 1985. The opening quotation of this editorial appears as part of the introduction to a paper entitled "The close ties between organometallic chemistry, surface science, and the solid state" by Roald Hoffman (joint winner of the Nobel Prize for Chemistry in 1981), Sunil D. Wijeyesekera and Shen-shu Sung (Cornell University, USA).

Chemistry International (CI) is, of course, a magazine and not a scientific journal. We openly welcome reports, letters and articles which reflect the enthusiasm of chemists at work. And fortunately we receive such items! For example, nobody who reads the autobiographical sketch by Dr Bryant Rossiter will doubt his enthusiasm for his work and nobody who has known Bryant Rossiter or been involved in CHEMRAWN activities will doubt that the success of this major IUPAC programme is in large part due to his tremendous drive and enthusiasm.

Other examples of enthusiasm in this issue of *CI* occur — of all places — in the item on organic chemical nomenclature. We read that ". . . the subject does not generate much interest among practising organic chemists", yet we find in the same article that its ". . . history is sprinkled with the names of famous organic chemists, such as Bouveault, Friedel, Grignard, and Tiemann". One such chemist was Pieter Verkade whose book is reviewed in this issue. Verkade was not only a "young and dynamic Professor Emeritus" but also a nomenclaturist "second to none".

Since its formation in 1919 IUPAC has relied heavily on the enthusiasm, expertise and hard work of chemists such as Verkade. Hopefully the pages of *PAC* and *CI* will continue to reflect such enthusiasm, expertise and hard work and help to sustain the Union in the future.

Medicinal Natural Products

The first ever IUPAC sponsored symposium in China was held in Shanghai, 10–14 November last year. The symposium — which was entitled Organic Chemistry of Medicinal Natural Products — attracted over 400 participants from 32 countries. These included chemists from ten developing countries supported by pharmaceutical companies in France, Japan and the USA.

The Chairman of the Organizing Committee was Prof. Wang Yu (Shanghai Institute of Organic Chemistry, Academia Sinica) who also presented a plenary lecture on 'Scientific evaluation of Tian Hua Fen (THF) — history, chemistry and application'. THF was first recorded as a medicine for re-establishing menstruation in 682 AD. It is prepared from the root tuber of *Trichosanthes Kirilowii* Maxim (Cucurbitaceae) and is used in China in mixtures with other herbal ingredients. Prof. Wang Yu reported that pure crystals of an abortion-inducing protein, trichosanthin had been

isolated from the root tuber. This protein is parentally employed as a safe abortifacient for women in mid-pregnancy and in combination with other medicines for early pregnancy. It is also effective in treating hydatidiform moles, ectopic pregnancy as well as choriocarcinoma.

The scientific programme of the symposium included lectures from many other outstanding chemists including Prof. Sir Derek Barton and Prof. Yuri A. Ochinnikov. The lectures are published in the May issue of *PAC*. Over 240 posters were also displayed at the symposium.

All sessions of the scientific programme were held at the Shanghai Science Hall and the Auditorium of the Shanghai Institute of Physiology, Academia Sinica. The symposium included an exhibition of Chinese traditional medicine. Participants also had the opportunity of visiting the Shanghai Botanical Gardens.

Keen interest in the poster presentations. ►

Auditorium of the Shanghai Institute of Physiology,
▼ Academia Sinica.



Over 400
participants
attended the
symposium. ▼



Prof. J. Mathieu delivers the opening speech. ►



Prof. Sir Derek Barton in rapt attention as he takes notes during a plenary lecture.

Plenary lectures presented at the International Symposium on Organic Chemistry of Medicinal Natural Products held in Shanghai, China, 10–14 November 1985:

- Investigations on West African medical plants (H. Achenbach, FRG)
- Isolation, structural and synthetic studies on the chemical constituents of medicinal plants of Pakistan (Attra-ur-rahman, Pakistan)
- Invention of new reactions useful in the chemistry of natural products (D. H. R. Barton and S. Z. Zard, France)
- Synthesis of isoquinoline and yohimbine alkaloids (A. Chatterjee, India)
- Natural products of cannabis and khat (L. Crombie, UK)
- Halichondrins — antitumor polyether macrolides from a marine sponge (Y. Hirata and D. Uemura, Japan)
- Recent developments in diterpene alkaloid chemistry in China (X-T. Liang, China)
- Studies with retinal pigments: modified point charge model for bacteriorhodopsin and difference FTIR (Fourier transform infrared) studies (F. Derguini, D. Dunn, L. Eisenstein, K. Nakanishi, K. Odashima, V. J. Rao, L. Sastry and J. Termini, USA)
- Bioorganic chemistry of rhodopsins (Y. A. Ovchinnikov, USSR)
- Contribution of an organic chemist to the reso-

lution of some biological problems: consequences (P. Potier, France)

Identification and characterization of an endogenous cytometallophore of general distribution in plants (K. Schreiber, GDR)

NMR studies of biosynthesis and enzyme mechanism (A. I. Scott, USA)

A general method for the stereocontrolled synthesis of polypropionate-derived sequences (G. Stork and S. D. Rychnovksy, USA)

Structural studies on bioactive microbial metabolites (Ch. Tamm, Switzerland)

Synthesis and chemistry of cyclopentenoid antibiotics (Y. Thebtaranonth, Thailand)

Scientific evaluation of Tian Hua Fen (THF) — history, chemistry and application (Y. Wang, R-Q. Qian, Z-W. Gu, S-W. Jin, L-Q. Zhang, Z-X. Xia, G-Y. Tian and C-Z. Ni, China)

Some recent progress in the synthetic and medicinal chemistry of cardioactive steroid glycosides (K. Wiesner and T. Y. R. Tsai, Canada)

Recent advances in chemical studies on the active principles from plants for fertility regulation (R-S. Xu and Y-S. Gao, China)

Total synthesis of arteannuin (Quingha and related compounds (W-S. Zhou, China)

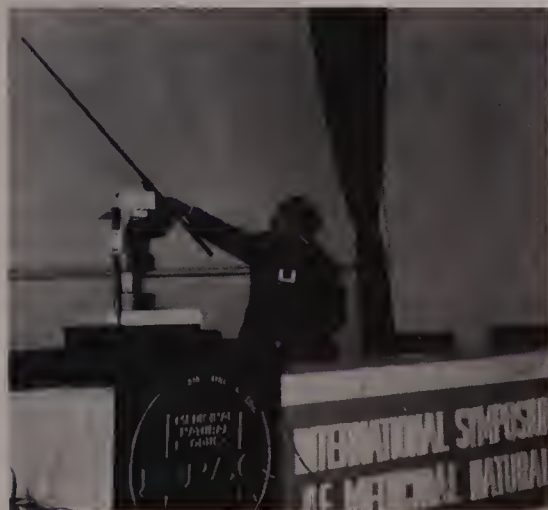
These were published in the May issue of PAC, Vol. 58, No. 5 (1986).

Need for well-characterized biological reference materials

Information on the current availability and characterization of biological reference materials was presented by representatives of national and international organizations based in Asia, North America and Europe when they attended the 2nd International Symposium on Biological Reference Materials held in Neuherberg (Münich), FRG, 24–25 April. A total of 111 participants from 23 countries attended this conference which was the first IUPAC sponsored conference to be held this year. Papers and posters at the symposium focused especially on trace elements in reference materials although several speakers, particularly those from developing countries, emphasized the need for well-characterized pesticide and trace organic reference materials.

100th AOAC Meeting

After holding all but one of the past 99 meetings in the Washington, DC area, the AOAC is holding its 100th Annual International Meeting and Exposition at The Registry, in Scottsdale, Arizona. The dates are 15–18 September 1986. AOAC is the Association of Official Analytical Chemists (see *CI*, Vol. 8, No. 3, pp. 7–8, 1986).



Prof. Wang Yu lecturing on Tian Hua Fen.

CI Supplement

The *IUPAC Handbook 1985–1987* will be published as a supplement to *CI* later this year. The supplement will include an alphabetical index to members of IUPAC bodies and details of current IUPAC programmes.

Chernobyl Reactor Accident

The World Health Organization (WHO) will intensify its action in coordinating the collection, analysis and speedy dissemination of information on the health effects of accidents resulting from the peaceful use of atomic energy, the Director-General Dr Halfdan Mahler, told the 39th World Health Assembly when it met in Geneva in May.

A number of delegates had expressed concern regarding the international health consequences of large-scale accidents such as the recent nuclear accident in Chernobyl, USSR. These included delegates from Sweden, the Netherlands, Chile, Canada and Cook Islands. In response, the Director-General told the Assembly: "I have already set in motion action to meet the legitimate expectations of Member States in this area".

He indicated that WHO had reacted speedily to the recent Chernobyl reactor accident by convening an expert group that had already presented a report, and that WHO's European Office will continue to follow the situation closely until it is

stabilized. Dr Mahler made his statement to the Assembly in the course of a discussion on WHO's collaboration within the United Nations system.

WHO's role will include coordinating the rapid exchange of information, preparing consolidated reports and disseminating them speedily to all Member States. The Organization's action will be taken through its network of national collaborating centres. "Should any serious accident occur in the peaceful use of atomic energy, the network of collaborating centres would go into non-stop action and WHO would issue consolidated reports on health effects as frequently as necessary and as rapidly as possible", Dr Mahler indicated.

The Director-General told the Assembly he was also calling on a multi-disciplinary group of experts to advise him on how WHO could further expand its role concerning the health effects of nuclear power accidents, including how to gain immediate access to all relevant information.

Dr Mahler assured Assembly delegates that WHO's activities would be coordinated with other UN agencies and international non-governmental organizations with a mandate in that area. He indicated that he would report fully on WHO's accelerated activities to the Executive Board in 1987, and to the 40th World Health Assembly later in the same year.

Following the Director-General's statement, a number of delegates voiced strong support for WHO's expanded activities in this field.

Letter to The Editor

IUPACRONYMS and Postacronyms?

Sir,

With reference to the article by Prof. J. Reedijk, entitled "IUPACRONYMS and abbreviations" (*CI* Vol. 8, No. 2, pp. 7–8, 1986) I wholeheartedly agree that "without acronyms . . . communications would be seriously hampered". For example, in my own field of thermal analysis, abbreviations such as DTA (differential thermal analysis), TG (thermo-gravimetry) and EGA (evolved gas analysis) are recommendations of the Nomenclature Committee of the International Confederation for Thermal Analysis (ICTA) and are readily and immediately understood by specialists. In addition, these abbreviations have been accepted by Commission V3 of IUPAC.

However, later in the same issue of *CI* (p.36) there is an announcement of a conference of the Centenary of the Discovery of Fluorine which contains a mind-bending acronym/abbreviation, and I quote . . . "For further information contact Roland Bougon, Secretariat, CDF, DESICP/DIR/A, C.E.N. + SACLAY . . ." I think I am correct in interpreting 'CDF' as 'Centenary of the Discovery of Fluorine'

but, please, what on earth does the rest mean, and do we really need acronymic addresses?

Dr C. J. Keattch,
Editor, *ICTA News*,
PO Box 9,
Lyme Regis,
Dorset DT7 3BT,
UK.

Editor: The address quoted in *CI* was taken from the conference circular. The General Secretary of the Symposium has informed us that,

DESI CP stands for Division D'Etudes de Séparation Isotopique et de Chimie Physique,
DIR for Direction,
A for Adjoint (Deputy),
C.E.N. for Centre D'Etudes Nucléaires,
SACLAY is a place.

Whether we need acronymic addresses or not I leave the reader to judge although I note that Dr Keattch has used acronyms in his own address! As far as *CI* is concerned we will continue to use the addresses that are given to us.

CHEMRAWN IV Rescheduled

CHEMRAWN IV, "Modern Chemistry and Chemical Technology Applied to the Ocean and its Resources," has now been rescheduled for 21–25 September 1987 at the Woods Hole Oceanographic Institution, Woods Hole, Massachusetts, USA. Dr Derek W. Spencer, Associate Director for Research at the Institution, has assumed responsibility as Conference Chairman. The conference is being restructured to fully meet CHEMRAWN objectives. In addition to IUPAC, the Woods Hole Oceanographic Institution and the American Chemical Society will sponsor the meeting. More sponsors may be added as the programme develops. The new meeting structure has met with an enthusiastic response from key members of the oceanographic, chemical, and funding communities.

IUPAC people

IUPAC Secretariat



Mrs Valerie Gomez, Secretary to the Scientific Publications Secretary, Mr P. Dass Gujral, leaves the IUPAC Secretariat in August — and for a very good cause. She is to devote more time to her family, especially to looking after her father who is in his 80s. Mrs Gomez, who joined the Secretariat in 1979, will be remembered as a most efficient and pleasant secretary.

We regret to record the death of:

Prof. F. Čůta, Czechoslovakia (15 March 1986) — Czechoslovak Delegation to IUPAC (1963, 1965, 1967)

Prof. P. Franzosini, Italy (24 January 1986) — Commission on Thermodynamics (1975–83).

Prof. G. Illuminati, Italy (22 January 1986) — Committee on Teaching of Chemistry (1970–81), Commission on Physical Organic Chemistry (1977–85).

Physics and chemistry of ice

The Seventh Symposium on the Physics and Chemistry of Ice will be held at Grenoble, France, 1–5 September 1986. Topics for discussion include:

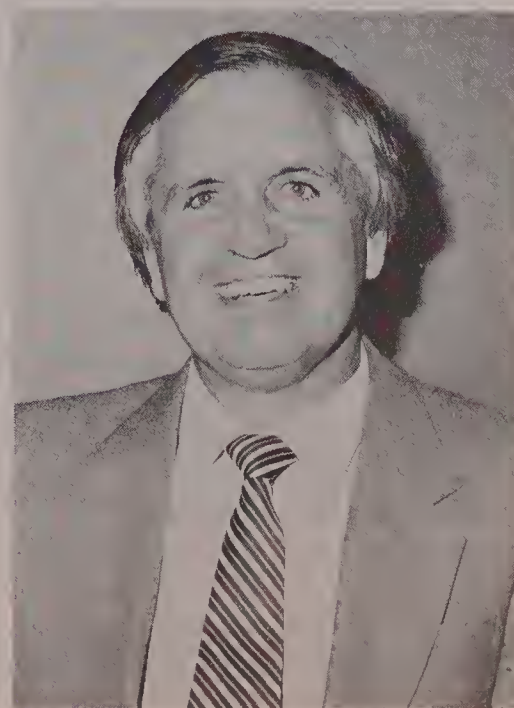
- Structures
- Defects in ice
- Solid-phase transformation in ice systems
- Surface structure and properties
- Applied ice physics and chemistry

English and French are the official languages of the symposium. Correspondence should be directed to: *Seventh Symposium on the Physics and Chemistry of Ice, Laboratoire de Glaciologie, B.P. 68, 38402 Saint-Martin d'Hères, France.*

Steyn becomes Chief Director of NFRI

The Council for Scientific and Industrial Research (CSIR) in the Republic of South Africa has appointed Dr Pieter Steyn as the new Chief Director of the National Food Research Institute (NFRI). Dr Steyn, who was formerly Head of the Division of Organic Chemistry of CSIR's National Chemical Research Laboratory, is a world authority on mycotoxins. These are toxic substances produced by fungi which occur on various grains and pose a potential threat for man and animals.

Since 1973 Pieter Steyn has served IUPAC in a number of capacities. He is currently Vice-Chairman of the Food Chemistry Commission (VI.1) and was Chairman of the Organizing Committee of the 6th IUPAC Symposium on Mycotoxin and Phycotoxins, held in Pretoria in 1985.



Dr Pieter Steyn.

Who's who in IUPAC

An autobiographical sketch of the life and work of *Dr Bryant W. Rossiter*, Chairman of the CHEMRAWN Committee

I was born 10 March 1931 in Ogden, Utah, USA. I moved to Salt Lake City at the age of three and there spent my formative years. I took my first job at the age of seven, selling the "Liberty Magazine". I have been continuously employed ever since. Early employment was necessitated by the need to earn all my personal and college expenses, including providing for a family through the college years. Among the jobs I had as a teenager was as a newspaper boy, restaurant dishwasher, ladies shoes salesman, a gandy dancer on the Union Pacific and Rio Grande railroads (laying track across the Utah and Wyoming deserts), cowboy and labourer on a Montana ranch, and grocery store clerk. Simultaneously I developed an active interest in sports, including basketball, baseball, fishing, hunting, backpacking and horseback riding.

From an early age I developed a great love for books, in particular autobiographies, journals, and other first-person accounts. I view my library as a pantheon of friends with whom I can consult, share adventures, develop experiences, or generate thoughts in almost any field of human endeavour. In this sense, Plato, Einstein, Christopher Columbus, the Apostle Paul, and Lee Iaccoca are among my choicest companions.

My first introduction to science was a chemistry set received as a Christmas present at the age of eight. I never took chemistry in high school, but learned the simple basics on my own, and through experimentation, to the chagrin of my parents, in the basement of our home.

In 1984, I entered the University of Utah as a chemistry major. Unfortunately, the Korean war came along and I was called into the United States Air Force where I was given the opportunity to study radar electronics. I was one of a dozen airmen selected for a special, experimental training course sponsored by the University of Illinois Electrical Engineering Department. The goal: to complete four years of college-level radar-related electrical engineering courses in 18 months. I successfully completed the school and later through a self-study process learned television repair on the side.

Upon my discharge from the Air Force in 1953, I returned to the University of Utah to pursue studies in synthetic organic chemistry, with a minor in electronics and physics. My television repair experience provided funds to pay for my education

and sustain my growing family. The unusual combination of synthetic organic chemistry and physics would play an important role in the interdisciplinary approach to science that has characterized my professional life.

In 1957, I received my PhD from the University of Utah and accepted a position at the Research Laboratories of Eastman Kodak Company in Rochester, New York. I was hired by Dr Arnold Weissberger who was known worldwide for his pioneering work in colour photography and a series of books he edited entitled *Physical Methods of Organic Chemistry*.

Initially, my work involved basic photochemical and auto-oxidative studies leading to an elucidation of the mechanisms of dye fading and the "yellowing" of colour photographic images. This research was helpful in achieving the remarkable stability characteristics of modern colour photography today.

In 1963, I succeeded Dr Weissberger as Head of the Colour Physical Chemistry Laboratory. I joined him as a co-editor of the John Wiley and Sons Interscience treatise, *Physical Methods of Organic Chemistry*, later to be broadened to *Physical Methods of Chemistry*. The latter is a seven-thousand-page treatise found in most technical libraries around the world. A completely revised 10- to 12-volume edition is now in progress, the first volumes of which will be issued within a few months.

From 1970 to 1984, I was Director of the Chemistry Division at Kodak, a research division of over 200 scientists responsible for some of the more basic and longer range research interests of the company. Presently I am Director of Science and Technology Development where I am concerned with developing major new business for the company where heavy research commitments are involved.

In 1973, I became a member of the United States National Committee to the International Union of Pure and Applied Chemistry. In the same year, the United States National Committee chaired by Dr Charles Overberger, proposed at the IUPAC General Assembly in Munich, Germany, that IUPAC ought to be concerned with the needs of humanity as well as the needs of chemists. Accordingly, the United States National Committee was asked to recommend ways in which the IUPAC charter might be broadened to include this aim. As a

member of the Committee, I submitted a brief document entitled "CHEMRAWN, Chemical Research Applied to World Needs." This statement became the basic part of a formal proposal presented by the United States National Committee at the IUPAC General Assembly in Madrid, Spain, in 1975. The proposal was unanimously approved by the delegates of the 43 nations involved, I was appointed by Sir Harold Thompson, then President of IUPAC, as the first Chairman of the CHEMRAWN Committee. The history of CHEMRAWN is generally known from that point to the present time.

I am also interested in improving dental health on a worldwide scale. For a number of years I have been a member of the Board of Trustees of the Eastman Dental Center, located in Rochester, New York. The Center is one of the world's foremost dental institutions. Many pioneering discoveries, such as fluoridation and dental sealants originated at the Center. In addition, the Center is a postgraduate school for such specializations as orthodontics, oral surgery, periodontics, etc. The Center treats approximately 50 000 patients per year. I served as Chairman of the board of Trustees during a period of time in which a new building was constructed, strategic planning processes instituted, and the groundwork laid for carrying the remarkable improvements of dental health in developed coun-

'Basically I view life as a four-legged stool, where each leg is represented by my family, church, professional, and humanitarian interests.'

tries to the Third World. Initial Third World studies are now underway in Sri Lanka and are expected to be expanded to other lands.

Coincident with my professional and family interests has been my work within the Church of Jesus Christ of Latter-day Saints. Within a year of my arrival in Rochester, New York, I was asked to serve as the Presiding Officer of the Church in the Western New York area. Since then I have had responsibility at one time or another for all church activities embracing the entire northeast quadrant of the United States and a corresponding territory in east Canada. Many weekends I can be found speaking to church leaders or members of groups of a few individuals to several thousand.

Basically I view life as a four-legged stool, where each leg is represented by my family, church, professional, and humanitarian interests. I believe life is most valuable and satisfying where one "grows" each leg at more or less the same rate; thus producing a stable and happy equilibrium. I

Dr Rossiter served as Chairman of the United States National Committee to IUPAC from 1977 to 1980. He is the principal architect and Chairman of IUPAC's CHEMRAWN Committee. CHEMRAWN is the acronym for "Chemical Research Applied to World Needs." This IUPAC innovation has been described as one of the most important new approaches to addressing directly some of the most pressing material needs of mankind. The initial CHEMRAWN enterprise was the "World Conference on Future Sources of Organic Raw Materials" held in Toronto, Canada, in 1978. Dr Rossiter was Chairman of CHEMRAWN II, the "International Conference on Chemistry and World Food Supplies — The New Frontiers," which was held in Manila, Philippines in December, 1982. This major international gathering involved key leaders and scientists from developed and developing countries and was devoted to meeting the mounting problems of world hunger and malnutrition. Other CHEMRAWN activities include conferences on chemical process technology; the chemistry of the oceans; the contributions of chemistry to human health; the chemistry of water quality and reclamation; and high-technology material for use in energy, communication, and transportation.



Dr Bryant Rossiter.

also believe those who are blessed with much should share their blessings with others. This has been one of the motivating forces behind my IUPAC activities.

My day usually begins at 5.30 a.m. with a 2- to 3-mile jog near my home. I find this period of physical exercise stimulates my thought processes as well. I frequently outline talks, letters, and presentations in my mind while loping through the woods, and then dictate these thoughts into a machine upon my arrival at the office. I seldom write out any documents in long-hand. I have enjoyed good health and have not missed a single day of work due to illness in nearly 29 years. I am

frequently in my office at 7.00 a.m., return home shortly after 6.00 p.m. and retire about midnight. My favourite hobbies are reading and horseback riding, including fox hunting.

I have been blessed with a marvellous and talented wife, the mother of our five boys and three girls. We are a very close-knit family, my single greatest source of joy. Because of time demands and an extensive travel schedule, I am concerned with the quality of time we spend together. We devote each Monday evening exclusively to family affairs and once a year take a month-long vacation together away from telephones, television, and the encumbrances of everyday life.

Affiliates in Ethiopia

This year 10 Ethiopian chemists became IUPAC Affiliates through the Chemical Society of Ethiopia. *Chemistry International* asked some of them what they thought of IUPAC and how they hoped to benefit from the Affiliate Scheme.

Last year invitations were sent to chemical societies in 35 developing countries inviting them to nominate young chemists to be sponsored as IUPAC Affiliates. The sponsorship was made possible by grants from the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the International Council of Scientific Unions (ICSU). By May this year 214 chemists from 14 developing countries had registered as Affiliates. These included 132 young chemists sponsored under the UNESCO/ICSU scheme.

The Chemical Society of Ethiopia was invited to nominate 10 chemists to become Affiliates and submitted its list to IUPAC in December last year. The National Affiliate Membership Secretary in Ethiopia is Ghirma Moges. He is responsible for implementing and operating the scheme in Ethiopia and liaising with the Affiliate Affairs Secretary at the Secretariat in Oxford. Moges is a lecturer in the Department of Chemistry,



**Dr Ghirma Moges, IUPAC
Affiliate Membership Secretary
in Ethiopia.**

Addis Ababa University (AAU). His research interests include the geochemical study of fluoride distribution in the fluorosis areas of Ethiopia and the spectrophotometric determinations of metals using organic analytical reagents.

One of the Affiliates nominated by the Chemical Society of Ethiopia is Shimeles Admasie, an Assistant Lecturer in the Department of Chemistry at AAU. When asked how he would expect to benefit from the scheme he replied "Although one would expect a number of benefits from an international body, I expect to be kept informed about critical developments in pure and applied chemistry through *Chemistry International* (CI). As a chemist I wish to know an effective way to communicate with chemists of the world especially with leading scientists in the field of my interest perhaps. Perhaps CI would provide me with an answer". Admasie is working on surface modified electrodes and their application to electrocatalysts. He is particularly interested in the electrocatalytic reduction of oxygen with reference to the conversion and storage of electrochemical energy.



**Shimeles Admasie in the Department of Chemistry, Addis
Ababa University.**

Several Ethiopian Affiliates confessed that they knew little or nothing about IUPAC until they received the blue leaflets informing them about IUPAC and the Affiliate Membership Scheme. For example, Tsegaye Tadesse, who is currently involved in research and teaching activities at Asmara University, said that "to be frank, before receiving the blue leaflet, I knew only that IUPAC is the authority on chemical nomenclature". Aberra Fura who is another lecturer in chemistry at AAU first heard about IUPAC in his introductory organic chemistry course. Later, as a result of attending symposia sponsored by IUPAC, he realized that IUPAC's activities were not just confined to nomenclature. The Union, he said, helps "facilitate communication among scientists in different areas of chemistry and in different nations" and thus "works towards the development of chemistry and towards its noble aim of improving human society".

Other Ethiopian Affiliates who responded with similar views and expectations of IUPAC included Ambachew Kifle (Production Department, Metahara Sugar Estate) and Zerihun Assefa (Mugher Cement Factory).



◀ Aberra Fura.



Tsegaye Tadesse. ▶

The Chemical Society of Ethiopia

Ethiopia is one of 12 Observer Countries of IUPAC. This status was introduced to enable small or developing countries to become involved in the Union. An Observer Country is eligible to send an observer to Council meetings — although the observer cannot vote. On payment of an annual service charge, the Observer Country receives basic documentation, *CI* and advance information about IUPAC sponsored conferences.

Ethiopia is represented as an Observer Country in the Union by the Chemical Society of Ethiopia (CSE). Although founded as recently as 1983 CSE already has a membership of 300. It organizes annual congresses and in 1984 co-sponsored an International Symposium

on the Chemical and Ethnopharmacological Aspects of Chat (*Catha edulis*). CSE also publishes a *Chemistry Newsletter*.

The President of CSE is Berhanu Abegaz who is Associate Professor of Chemistry at AAU. Prof. Abegaz is currently engaged in phytochemical investigations of plants of medicinal and commercial importance in Ethiopia and the synthesis of natural products and related compounds. His research work had resulted in over 20 publications including 7 patents. He is editor of *Alkaloids and Anthraquinones of African Medicinal Plants*.



Prof. Berhanu Abegaz,
President of the Chemical
Society of Ethiopia.

Affiliates soon to become "visible" as potential recruits

"As an Affiliate member of IUPAC you would:

Be visible as a potential recruit for the scientific work of the IUPAC Commission(s) of most interest to you."

This is Benefit No. 1 as stated in the blue letter of invitation which all Affiliates received prior to their registration. But how will Affiliates become visible?

Plans are now well advanced to set up an Affiliate Membership Database at the Secretariat in Oxford. This database will contain a profile of each Affiliate based on the information supplied on the blue Affiliate Registration Form. On that form Affiliates are asked to indicate a specific interest corresponding to an IUPAC Commission.

In December 1986 the Affiliate Affairs Secretary will extract from the database a 'Recruitment List' for each Commission. Each list will consist of the names and addresses and other details of all Affiliates who have registered a specific interest in that Commission. Copies of these lists will be sent to Commission Chairmen. The Chairmen will thus have the opportunity of approaching Affiliates to enquire about their suitability for filling Commission vacancies before appointments are made at the General Assembly in Boston, USA in August next year.

Convergence of Styles for Literature References in Publications

Dr Siniša Maričić

At its meeting in Oxford, 1–3 July 1984, IUPAC's Committee on Publications (CP) took note of the Executive Committee recommendation to look into the possibility of introducing a common system for literature references. It noted that if such a system were to be introduced a comprehensive survey/study would be needed. As the first step towards this goal the following report was submitted to the meeting of CP held in Lyon, 4–5 September 1985. It was accepted for further circulation* as a discussion paper.

Introduction

A report by Ms Maeve O'Connor (CIBA Foundation, London, UK) entitled, "Bibliography on bibliographical references" contains 77 items and indicates that the subject is still being debated. In the years 1968–77 an average of 2.4 papers on the styles in cited references were published per year. During the past seven years the figure was 7.6.

The pragmatic approach

Two styles of presenting the references in a text or as a list at the end of a paper have developed. One, frequently called the *Harvard* style, presents the authors' names and years of publication within the text together with an alphabetical list of the references at the end of the text. The second uses *sequential* numbering of references in the text and also in the list. Hybrid systems of the two have also been used.

The sequential system was adopted (and adapted) by a meeting of medical editors in 1978. They declared that the uniform requirements for article references "are merely an extension of those agreed by 30 American clinical journals as long ago as 1970 and found to be acceptable by both editors and authors". They added that "... the journals participating at present, and who have agreed to change, must number over threequarters of a million readers".

Table. Reference styles in chemistry journals

publishing country	Harvard style	sequential style
USA	6	24
USSR	—	23
UK	3	15
FRG	2	11
France	—	4
Switzerland	—	2
Other	5	49
Total	16	128



Dr Siniša Maričić, Member of the Committee on Publications, formerly Head of the Research Library of the National and University Library in Zagreb, Yugoslavia.

Which styles of references are used in chemistry journals? To answer this question we scanned the journals on the shelves of the local chemical library and obtained the statistics shown in the Table.

This sample of journals is not statistically representative. However, in spite of great difficulties in purchasing foreign journals over recent years the library has kept its core by exchanges for a domestic journal. Even so, the sequential style outweighs the Harvard style to such an extent that it could not be due to a "skewed" selection of journals. Chemical journals obviously seem to prefer the sequential style although it is not yet known whether authors *and* the readers also accept it.

A note of caution should be sounded at this point. While the above table indicates preference for the sequential style, these journals differ in the detailed presentation of bibliographical references. It might be worthwhile to check the validity of the above statistics a little more closely. If correct an attempt might be made to homogenize the sequential style.

Computer technology and personal computers in particular could well be used to simplify the transformation of manuscripts before the typesetting stage to an extent that would ease most, if not all, the problems in dealing with references. In our library, for

*This is a slightly abridged version of the original report which was published in *European Science Editing*, No. 28, pp. 4–6, 1986.

instance, we routinely convert bibliographic data from one database with its particular format to another database with a different one. Furthermore, UNESCO has recently issued a Common Communication Format to facilitate such transformation on a larger, multi-functional scale. The UNESCO Format has been implemented by the European Communities under the title "FORMEX".

The analytic approach

Looking broadly at the literature on the topic of reference styles I find that most of the debate originates in strongly partisan views of those involved from different standpoints in the system. On the other hand, in a number of articles, a more comprehensive attitude has been demonstrated. Any proposal to standardize bibliographical references must aim at optimization. But what is there to optimize?

As far as I can see there are two levels at which this may occur. First, there is the structure of scientific communication, and secondly there is the performance of the communication cycle. There are a number of interplays between various action-points on these two levels. It is these interplays which lead to the current debate.

Information ecology may seem an unusual term, but it has appeared in information science literature. I mention it here only because the structural level (referred to hereinafter as Level-S) consists of two

parts: a core, and its surroundings, or environment (hence ecology!). Let us call these two parts Level-S/C and Level-S/E, respectively (see figure).

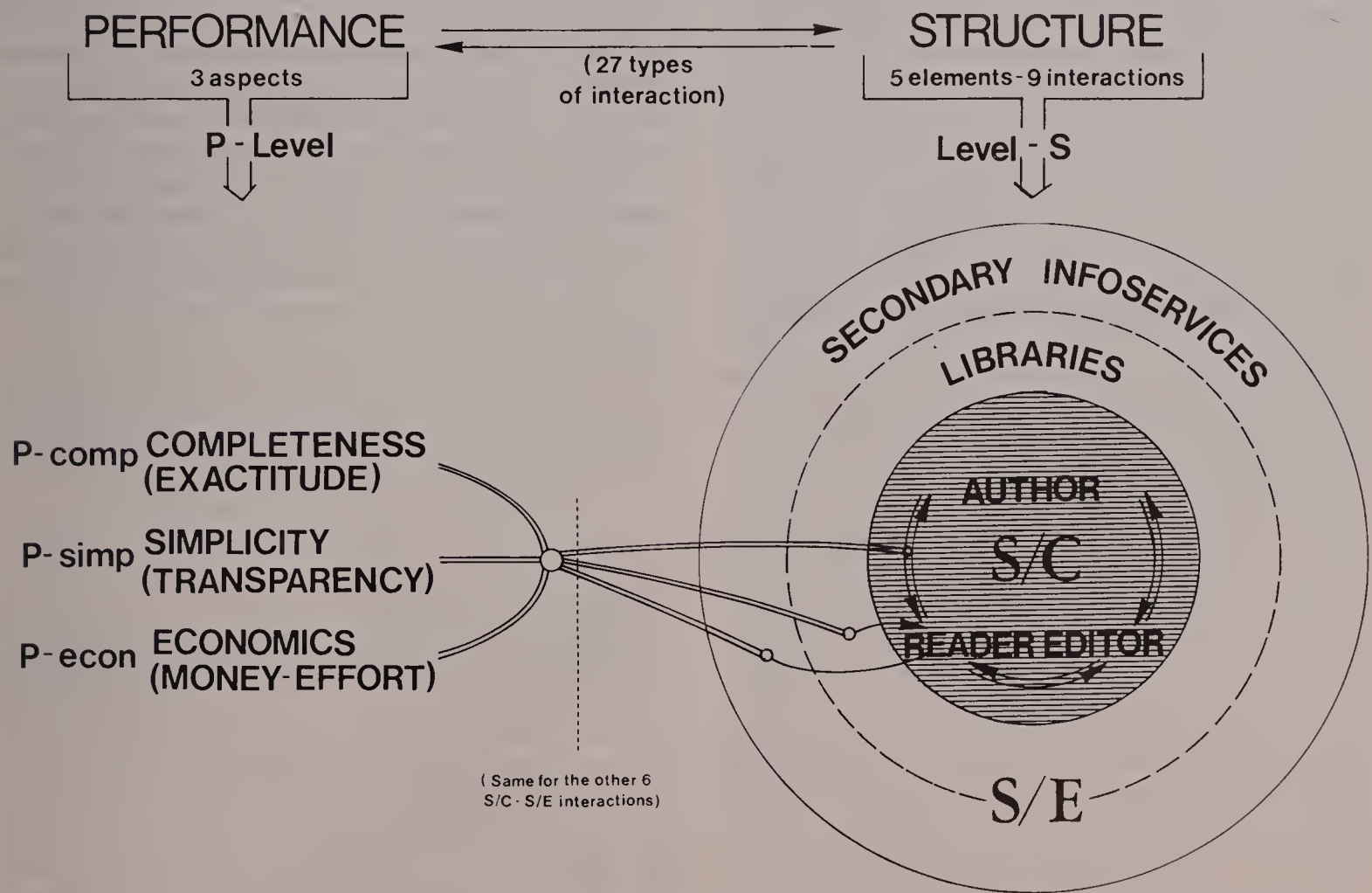
Level-S/C is the science communication circle and involves authors, editors and readers. These are interconnected in three pairs. Most frequently in the natural sciences but less so in the social sciences and humanities, the authors and readers are the same individuals in their dual role.

Level-S/C is surrounded by Level-S/E which consists of a number of organizations. It is thus different from Level-S/C since the latter is characterized by individual activity. For our purposes let us take Level-S/E to be secondary information services and libraries. At each action-point of the Level-S/C "triangle" there is an interaction with the two from level-S/E, that is, with the secondary information services and the libraries. We thus have nine possible interactions — each with different ways of communication and each with different requirements at the performance level (hereinafter called the P-Level).

From a study of the literature I have been able to delineate the following requirements for the P-Level:

- completeness, including exactitude, of bibliographic information (P-Level/comp)
- simplicity of the bibliographic reference, that is, easy readability or transparency (P-Level/simp)
- the economics of the bibliographic reference: with respect to time, money and effort (P-Level/econ).

Now, with these three requirements for the performance of communication at each of the nine interactions,



Schematic representation of the interaction between the structure level of scientific communication and its performance level.

there will be 27 possible sources where problems may arise. And, let us bear in mind, that for our purpose Level-S/E was taken to contain only two types of organization.

Maeve O'Connor has stated (*The Lancet*, December 23 & 30, 1978, p. 1373) that "A uniform style for citing references in the text is clearly unattainable. . .". In another of her papers (*British Medical Journal*, 1978, **1**, 31–32) on the subject, Ms O'Connor refers to reports that 33 different styles of reference were found in 52 journals and that there are 2632 possible ways of setting out references in references lists. These figures indicate that the scheme presented above is of very modest complexity. However, it does provide a rational framework to explain the observed diversity in referencing habits. The question now is: does this scheme provide a hierarchy of priorities for making decisions on the optimal choice of reference patterns?

IUPAC, with its Committee on Publications and other bodies, encompasses all Level-S and P-Level factors. Their interactions are of varying intensity. A full analysis of all these is beyond the scope of this report. In what follows I suggest the scale of priorities which could form the basis for IUPAC recommendations for reference styles.

Scale of priorities

Let us start with the P-Level/comp. The completeness of information in bibliographic references is obviously at odds with the simplicity of references, that is the P-Level/simp. The fuller the data in the references, the less simple they can be, and the more expensive they are likely to be (P-Level/econ).

At Level-S/C authors would certainly prefer a high P-Level/simp, even at the expense of P-Level/comp. Editors would probably be divided on this point. Now, although a reference is a two-way channel of communication, it is primarily directed towards the reader who is, of course, being served at Level-S/E by both the secondary scientific information services and the libraries. At Level-S/E, that is, within the information environment of science, complete and precise bibliographic references are highly desirable.

I am therefore tempted to conclude that the *first priority* should be *completeness and exactitude* — that is P-Level/comp. This implies that we must first satisfy the *reader* together with the services which provide him/her with information. In certain cases it may be necessary to consider allowing P-Level/simp to take priority over P-Level/comp in order to satisfy demands at P-Level/econ, particularly from editors and publishers.

The relationship between P-Level/simp and P-Level/comp mostly concerns layout. This includes the use of blank spaces and different typesetting for the various parts of a reference. Aesthetic factors are also involved; although these may be in conflict with P-Level/econ.

Operational principles

To attain a proper ecological balance within this information field I submit the following operational principle. Editors and publishers from Level-S/C together with the secondary information services from Level-S/E should take on any extra burden resulting from the demands of the first priority. This means that some diversity could be allowed with respect to the authors. Readers should not take the burden. It should be the editors' and publishers' responsibility (at both Levels-S/C and -S/E) to smooth out any inconvenience to the author and give the reader priority. Librarians may have mixed feelings about this. If they are good, they will want to help authors compile proper references. If they are not involved in the editorial work of authors, they will probably prefer to give priority to reference styles which facilitate picking out primary documents.

The second operational principle is that *deletions* from a manuscript are easier than additions. Punctuation is an exception. If the final version of the references requires additional punctuation there is usually no difficulty in inserting it if blank space is available.

Conclusion

My final conclusion accords with Maeve O'Connor's view — (expressed succinctly in the *British Medical Journal*, 1978, **1**, 31–32), that because a *uniform* system could not be imposed, a new equilibrium within the ecology of this information field should be attained through a natural process with minimal "pressure-jumps". A *flexible* recommendation is needed which will initiate a process of *style convergence*.

"Bibliographical Reference in Scientific Publications. Suggestions from a CIBA Foundation Workshop" (published in *Endokrinologie-Informationen* 5/1978, p. 175–1982, and elsewhere) may well provide a suitable basis for further discussion on such a recommendation.

Please note that I have not included a list of references in this report. Furthermore, I have left the references cited in the text of this report exactly as I found them in the original journals.

Comments welcome

Comments on this discussion paper are welcome and should be sent to:

Dr S. Maričić,
The Croatian Chemical Society,
Marulićev trg 19,
YU-41001 Zagreb,
Yugoslavia.

Chemical societies in industrial countries — their past and future roles in development

Dr Wolfgang Fritsche

The following article is based on a paper presented by Dr Wolfgang Fritsche at the 10th Meeting of Presidents of Chemical Societies held immediately after the IUPAC General Assembly in Lyon, September 1985.

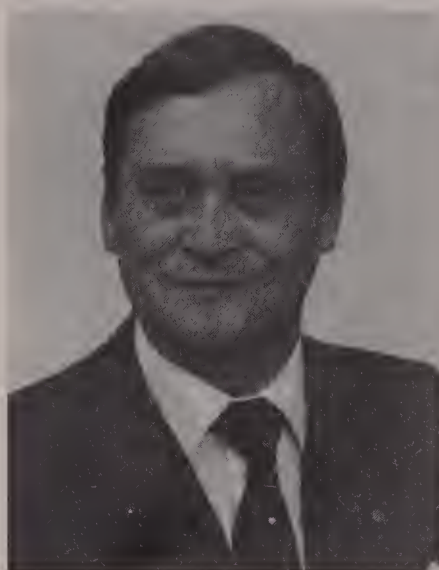
Early scientific societies

Scientists have always shown a desire to meet and exchange information. This can be considered the nucleus for the creation of scientific societies which then grew up in different ways. In former centuries scientific scholarship was a privilege enjoyed by exclusive circles of small numbers of people. Consequently, the first scientific associations generally had few members appointed to these institutions. I am thinking in this context of the academies of sciences. These were associations of learned men whose tasks were to promote the exchange of information and thus to promote the advancement of science itself. Such academies exist in many countries for all intellectual disciplines including the natural sciences.

The first academy in medieval times was the Academia Platonica founded in 1470 in Florence in Italy. Richelieu founded the Académie Française in 1653 in Paris, and in 1616 the highly respected Royal Society was founded in England. Their aim was the promotion of the natural sciences from both the theoretical and experimental points of view. In my country the Prussian Academy in Berlin was founded under the patronage of King Frederic I in 1700. It became the oldest, richest and largest of the German academies of those days. Its membership is limited like that of other academies.

The 19th century saw great advances in the sciences and technology. A rapid and fruitful development of scientific research and teaching at universities during the middle of the 19th century was paralleled by the foundation of successful industries, whose processes were based on the scientific achievements of the learned scientists and engineers. Let me mention some examples from my own country.

In the field of chemistry names like A. W. von Hofmann and Justus von Liebig were as intimately linked to the foundation of centres for research and teaching of chemistry at universities as well as with the fundamental research on chemical compounds which were industrially exploited with unparalleled success. A. W. von Hofmann designed the most modern research laboratories of his time in London, Bonn and Berlin, was a renowned lecturer and also carried out successful research on aniline dyestuffs which formed the basis for the German dyestuffs industry. He founded the German Chemical Society in 1867.



Dr Wolfgang Fritsche,
Secretary General of
Gesellschaft Deutscher
Chemiker (GDCh) and
the Federation of
European Chemical
Societies (FECS).

This development resulted in an increase in the number of scientists, and a parallel decrease in their exclusivity. As a consequence there was a desire to create scientific societies open to all interested scientists. The Chemical Society in the United Kingdom was founded in 1841, the German Chemical Society in 1867 and the American Chemical Society in 1876. The inauguration of scientific societies in many disciplines and in many countries throughout the world continues until the present day.

Scientific societies and development

The free of exchange of experience in natural and engineering sciences among individual scientists within a national society, between societies in regional federations, and finally in worldwide institutions is of the utmost importance for the progress of science and its applications, especially in contributions to future needs.

Scientific societies are therefore of the utmost importance for development. Industrialized and developed countries have profited from their activities in the past and will do so in the future. It is my firm conviction that all countries need strong scientific societies. Those countries which have no scientific societies, particularly developing countries, should not hesitate to create them.

Scientific societies provide the basis for communication of ideas between industrial chemists and universities. As neutral learned institutions they can initiate or

improve the collaboration between industry and universities to promote research. The needs of the future can only be met by such joint efforts.

In industrialized countries most basic research is done in the universities. Applied research is usually regarded as the task of industry. German chemical industry, for instance, developed as a result of the rapid progress which the science of chemistry experienced 100 to 150 years ago in Germany. The connection between eminent university professors and the founders of chemical industries were extremely close. Basic research and industrial development thus proceeded along parallel tracks. Nowadays, top management in the chemical industry consists mainly of chemists, many of whom are eminent scientists. Industry values highly the transfer of new ideas from basic research at universities to their application and development in industry. I recommend that this principle of cooperation which has benefited the development of industrialized countries should be adopted by all countries in all stages of development. Scientific societies can play an important role in establishing and maintaining such a system of cooperation and communication.

The world is in a period of extremely rapid technological change. Many of these changes are already beginning to have a far-reaching impact on developed countries and, because of the increasingly interdependent nature of the global economic and political system, on developing countries as well. Indeed, one of the most widely recognized areas of technological change, namely micro-electronics, has been compared, in terms of its impact, to the Industrial Revolution of the nineteenth century. Other areas of technological change that are currently emerging appear likely to have at least as great, if not greater, impact on countries at all levels of development. Examples include the field of energy which is so critical to all countries and the impact of major changes in biotechnology, synthetic material technology and gene technology.

The types of challenges and opportunities faced as a result of emerging and prospective challenges in advanced technologies are likely to be of such a basic and pervasive nature that early identification of these

A. W. von Hofmann designed the most modern research laboratories of his time in London, Bonn and Berlin.



changes is crucial to formulating and implementing effective responsive strategies. In a similar manner, changes in advanced technologies may open up exciting new opportunities of an equally pervasive character for developing countries. Thus, if new techniques of mineral exploration and exploitation reveal major new natural resources to be developed within a country, the task of exploiting these resources on any scale will involve the mobilization of substantial capital resources and the creation of technological, communication and transportation infrastructures. All these require long lead times for execution.

Scientific societies can be a clearing house for the exchange of experience and can contribute to the solution of problems by promoting scientific discussion and providing additional information. Last but not least, they can define priorities for future research and development in science.

Industrialized countries need to devote more effort to finding processes which reduce environmental hazards and energy consumption. For example, there is a need for more specific-acting and less-toxic pesticides and also for detergents which work in smaller amounts and possess better biodegradability. New materials and processes are also needed for the restitution of waste water. Energy will remain a problem. There will certainly be a lot of activity on the development of alternative sources such as solar energy but fossil fuels and nuclear energy will still have to carry most of the burden. Most industrialized countries are situated in colder climatic zones. Thus, it is doubtful whether solar energy and the renewable resources depending on it will be able to contribute sufficiently.

Scientists need to be made aware of these problems at an early stage in their education. This applies to both developed countries and developing countries although the problems will be of a different nature. Scientific societies can make recommendations on how science education should develop in view of these problems. These recommendations should again be a result of collaborative discussions in which representatives of industry and universities as well as governmental and non-governmental institutions take part.



The Royal Society, London was founded in 1616.



Justus von Liebig was intimately linked to the foundation of centres of research and teaching of chemistry at universities.

Transfer of information

It is thus evident that scientific societies, with their competence in the specific fields represented by their members, are in a good position to discuss the problems connected with progress and development. In science-based industries scientific societies must play a dominant role in preparing the pathways for technological progress by providing optimal possibilities for the transfer of information about the results of research and development for the use of the international community, and in the first place, of course, for fostering development in their own countries.

Scientific societies have at their disposal a considerable range of activities which can help achieve this. For example, chemical societies can make available to chemists, including those in developing countries, primary literature in chemistry and other documentation and information services.

In developing countries scientific societies might consider creating national or regional journals to communicate the indigenous know-how produced in these countries. This will also have the psychological effect of encouraging people to cope with their difficulties on their own.

Scientific societies can also be responsible for the transfer of information by means of conferences, symposia and congresses. Such organized meetings provide our colleagues with the opportunity of exchanging information about the progress and developments in their special fields of work. In many cases, this transfer occurs faster at such meetings than is possible by the time-consuming study of the literature. These events also promote the establishment and

strengthening of personal communication between scientists. The value of scientific societies in promoting this sort of communication is indispensable. Societies are in continual contact with prominent scientists who are aware of topics of interest. This type of activity also requires international cooperation and presupposes societies receive advance information about such events not only in the region of the individual society but ideally worldwide. Exchange of this kind of information is, therefore, absolutely necessary and worldwide networks need to be established. My society has, for some years, acted as a centre for compiling and distributing to the member societies of the Federation of European Chemical Societies a calendar of all known events in chemistry in the world. This calendar is available to other societies.

Scientific societies can also be responsible for the organization of in-service training courses. The German Chemical Society offers 70 to 80 such courses every year. In-service training courses should be open to any scientist irrespective of his or her country. In Germany, on my initiative, we have started a programme to "export" such courses to developing countries. This followed a successful experiment at Mahidol University in Bangkok in March 1983. In October 1985 we conducted a GDCh course in Guangzhou, Shanghai and Beijing in cooperation with the Chinese Chemical Society and the Academia Sinica. This activity of my society is supported by our Foreign Office and received financial support from the Max-Planck-Gesellschaft.

Scientific societies should also be involved in legislation affecting science technology. They should demand from their governments that they are regarded as competent bodies in all related affairs.

Another important issue for scientific societies is the transfer of information about science and technology to the layman and the general public. This communication



Carl-Bosch-Haus, Frankfurt, headquarters of Gesellschaft Deutscher Chemiker.

must be adapted to suit the public. The scientific societies can disseminate knowledge of the beneficial effects of scientific and technological progress. This is particularly important since certain groups try to discredit scientific progress, although this progress is essential for the survival of the human race. National scientific societies should exchange information about their experience of these activities, because prejudice against science and technology seems to be a worldwide phenomenon these days. The image of science and technology can only be improved if scientists are ready to transfer an adequate portion of their scientific and technological knowledge to the public. Scientific societies and their international organizations, like the regional federations, can play an important role in this respect because of their neutral position between society, government and industry.

"The image of science and technology can only be improved if scientists are ready to transfer an adequate portion of their scientific and technological knowledge to the public."

They should assist their members and stimulate them to cope with this challenge. They should also develop their own public relations activities. The priority for scientific societies in industrialized countries in this respect should be to improve the bad image of science

The public understanding of science

The Royal Society report *The Public understanding of science* deals with matters that have long been of concern not only to the Royal Society itself, but also to the broader scientific community. Prepared by an *ad hoc* group under the chairmanship of Dr W. Bodmer of the Imperial Cancer Research Fund, UK, the report contains advice for educationalists, the mass media and industry.

It begins with an analysis of why it matters that non-scientists should understand science and of what sort of understanding is needed by people in different roles. It then tries to assess present levels of understanding, looking at surveys of public attitudes to science and a number of other indicators. The remaining chapters deal with mechanisms for effecting public understanding of science: the formal education system, the mass media, the activities of the scientific community itself, public lectures, children's activities, museums and libraries, and industry.

The report has recommendations for all the sectors concerned. It points out that science and technology pervade nearly all aspects of modern life, from individual health to national prosperity to the quality of public decision-making. Improving public understanding of science is not a luxury: it is a vital investment in the future well being of our

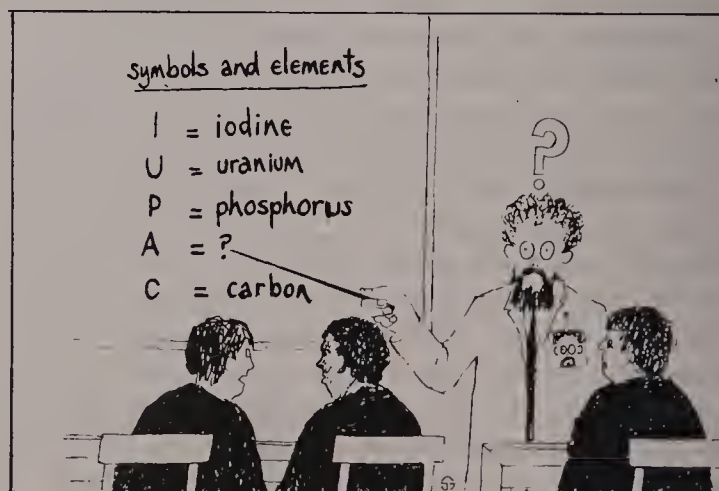
and technology. Scientific societies of the developing countries should try to avoid the mistakes of industrialized countries. They face widespread ignorance about science and technology among the majority of the population. This ignorance often leads to an over-estimation of the unfavourable side-effects of technology and thus hostility to this progress.

In industrialized countries we must try to minimize the lack of information of the man in the street about science and technology. Scientific societies in developing countries should take care from the beginning that this does not come about at all. Popularization of science and technology seems to me to be one of the major factors in promoting the acceptance of new technologies which are indispensable to meet future needs. We need to find the most efficient and appropriate ways for the transfer of scientific and technological knowledge to the general public.

Scientific societies and their international organizations should continue to promote the exchange of scientific and technical information in different parts of the world. All developing and industrialized countries should be given access to the scientific and technical information available in the world. Scientific societies have an obligation to provide this communication to their utmost ability to make their contributions to meet the needs of future development. The scientific societies of developing countries should join in this effort for the benefit of mankind and of their own countries.

society. The initial responsibility for achieving an improved public understanding lies with the scientific community itself, and the report's main recommendation is therefore addressed to scientists: "Learn to communicate with the public, be willing to do so and consider it your duty to do so".

The report is published by The Royal Society, 1985 and is available from the Publication Sales Department, The Royal Society, 6 Carlton House Terrace, London SW1Y 5AG, UK. Price £6.90. A summary pamphlet, Science for everybody, is available free from the Royal Society.



100 Years of Nickel Toxicology

In this paper, F. William Sunderman Jr (Past-President) and Stanley S. Brown (President) of IUPAC's Clinical Chemistry Division (VII) review 100 years of nickel toxicology. The paper appeared as an introduction to the Proceedings of the Third International Conference on Nickel Metabolism and Toxicology which was held in Paris, 4–7 September 1984. The proceedings were published in a volume entitled *Progress in Nickel Toxicology** (see *CI*, 1985, No. 4, p. 38).

Nickel Toxicology 1884–1950

The Paris Conference celebrated the centennial of T. P. Anderson Stuart's pioneering research on nickel toxicity (Stuart, 1884). Although Gmelin (1826) had reported that salts of nickel and 16 other metals are toxic for animals, the science of nickel toxicology was established by the studies that Stuart (Fig. 1a) performed in 1880–83 at the Pharmacology Institute in Strasburg, Germany (now a part of Alsace Lorraine in France). Oswald Schmeideberg (Fig. 1b), the Professor of Pharmacology at Strasburg, had been educated in medicine at Dorpat in Estonia (now Tartu in USSR) and he had served subsequently as assistant to Rudolph Buchheim, Professor of Pharmacology in Dorpat. In 1872, Schmeideberg accepted the newly created Chair of Pharmacology at Strasburg, and he soon attracted numerous young physicians and scientists for pre-doctoral and postdoctoral training at the Institute of Pharmacology (Fig. 2). Several of Schmeideberg's students became world-famous leaders of pharmacology, including John Jacob Abel, Otto Loewi, Arthur Cushny, and Torald Sollman (Holmstedt and Liljestrand, 1981; Fisher, 1984). Anderson Stuart, a medical graduate of the University of Edinburgh, joined Schmeideberg's staff in 1880 and began to study the toxicities of nickel and cobalt compounds. Previously, Schmeideberg had supervised other students in investigations of the toxicities of lead, platinum, antimony,



Fig. 1. (a) T. P. Anderson Stuart — a photograph taken at the time of his pioneering work on nickel toxicology: (b) Oswald Schmeideberg, Professor of Pharmacology at Strasburg.



Fig. 2. The Institute of Pharmacology, Strasburg, where T. P. Anderson Stuart's work on nickel toxicology was conducted.

mercury, and tin; accounts of their findings may be found in the *Archiv der Experimentellen Pathologie und Pharmacology*. In Stuart's own words (Epps, 1922) —

"... I studied at Strasburg physiology and chemistry under Hoppe-Seyler, experimental physiology under Goltz, and experimental pharmacology under Schmeideberg. I used to also go round the medical wards with Kussmal. In Schmeideberg's laboratory I investigated the physiological properties of the salts of nickel and cobalt, and on the results wrote a thesis for my M.D. (obtained in 1882) for which I was awarded a gold medal ... Oscar Schmeideberg was a great authority on pharmacology and anxious to tell his pupils all he knew, and it was a real pleasure to work under him. ... I had a very happy time at Strasburg; everyone was very kind to me, and I made friends who have remained friends ever since."

Stuart's report in Schmeideberg's *Archiv* (1884) provided the first comprehensive survey of the acute toxic effects of nickel salts, which were administered by oral and parenteral routes to frogs, pigeons, rats, guinea-pigs, rabbits, cats and dogs. The questions that Stuart posed concerning mechanisms of acute nickel

**Progress in Nickel Toxicology: Proceedings of the 3rd International Conference on Nickel Toxicology Paris: September 1984* Edited by S. S. Brown and F. W. Sunderman, Jr, Blackwell Scientific Publications, Oxford, 1985. 270 pp, 50 illustrations. US-\$32.00/£27.50. ISBN 0 632 01355 9.

toxicity are only now beginning to be answered by research on cellular uptake of nickel by calcium ion channels and by studies of free radical mechanisms for toxic injury of cells by nickel ions.

The Stuart was highly regarded by Schmeideberg is evident from correspondence appended to Epps' biography:

From Dr. O. Schmeideberg, Professor and Director of the Pharmacological Institute, Strasburg [Translation.]
Strasburg, May 25th 1882.

My Dear Anderson Stuart,

You inform me of your intention of applying for the post of Teacher of Anatomy and Physiology at the Medical School lately founded in Sydney. On the one hand, I regret this, as it will take you so far away from us; on the other hand, I shall be glad if you find this an opportunity which will enable you to follow your inclination and devote yourself entirely to a scientific career. With your love and zeal for scientific labours and investigations as well as with your indefatigable endeavours to acquire the intellectual and manual accomplishments necessary for a Teacher and Investigator in the domain of the medical sciences, I became sufficiently acquainted when I had the pleasure of seeing you in my laboratory successfully engaged in the carrying on of scientific investigations. I know how well you succeeded in acquiring a profound knowledge and skill, and am convinced that, be the field of your activity in your native country or far away among the antipodes, we shall become indebted to you for many a valuable scientific discovery.

I wish you may have the success you deserve, and am, your most devoted.

O. Schmeideberg.

In 1884, Stuart accepted the Chair of Physiology at the University of Sydney, Australia; he did not pursue further research on nickel toxicity, and his great work was the foundation, establishment and development of the Medical School at Sydney, where he died in 1920.

Nickel Toxicology 1950–84

During the 1950s and early 1960s, interest in nickel toxicology was rekindled by the researches of Richard Doll, John P. W. Gilman, William C. Hueper, Gaetan Jasmin, J. Gwynne Morgan, and F. William Sunderman, Sr (for references, see National Academy of Sciences, 1975). The remarkable growth of research on nickel toxicology from 1960 to 1984 is attested by the annual citations on nickel in *Cumulative Index Medicus* (Fig. 3).

In 1975, the Commission on Toxicology, IUPAC Clinical Chemistry Division, established the Subcommittee on Environmental and Occupational Toxicology of Nickel, the founding members being:

I. Andersen (Nor)	L. Morgan (UK)
R. T. Barton (Can)	S. Nomoto (Jap)
R. Bourdon (Fr)	T. Norseth (Nor)
S. S. Brown (UK)	L. Renzoni (Can)
J. J. Clary (USA)	B. Roy (USA)

A. C. Hogetveit (Nor)	J. Sjöholm (Swe)
K. S. Kasprzak (Pol)	M. Stoeppler (FRG)
E. Mastromatteo (Can)	F. W. Sunderman, Jr (USA)
M. D. D. McNeely (Can)	D. Tonks (Can)
J. Meininger (Fr)	H. Zachariassen (Nor)
M. Mikac-Devic (Yug)	

Sadly, Dr Richard T. Barton died in 1981; the Plenary Lecture of the Paris Conference on Nickel Toxicology was dedicated to him, in recognition of his scientific leadership, clinical expertise, and dedication to cooperation between academia and the nickel industry.

The Paris Conference was the twelfth meeting of the Nickel Subcommittee:

1. INCO Ltd, London, June 1976	Founding Meeting
2. Connecticut University, Farmington, December 1976	Scientific Program
3. Congress Centre, Monte Carlo, March 1977	COMTOX-1 Symposium
4. Warsaw University, Warsaw, August 1977	IUPAC Assembly
5. Caledonian Hotel, Kristiansand, May 1978	1st Ni Conference
6. Congress Centre, Davos, September 1979	IUPAC Assembly
7. University College Swansea, September 1980	2nd Ni Conference
8. Leuven University, Leuven, September 1981	IUPAC Assembly
9. Trinity College, Dublin, June 1982	Scientific Meeting
10. Sheraton Hotel, Montreal, July 1982	COMTOX-2 Symposium
11. Technical University, Lyngby, August 1983	IUPAC Assembly
12. St. Jacques Hotel, Paris, September 1984	3rd Ni Conference

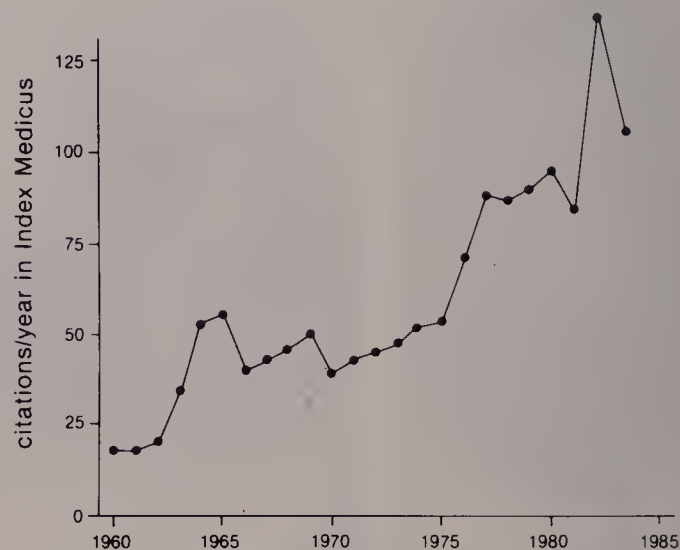


Fig. 3. Annual citations on nickel in *Cumulative Index Medicus* (1960–84).

For background information on nickel analysis, metabolism, toxicology and health effects, readers may consult recent monographs and articles by Nriagu (1980), Brown and Sunderman (1980), Bencko (1983), Mushak (1984), Norseth and Piscator (1984) and Sunderman (1984).

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Acknowledgements

Fig. 1a and Fig. 1b are reproduced respectively, with permission, from Epps (1922) and Holmsted and Liljestrand (1981). Fig. 2 is reproduced by courtesy of Dr James W. Fisher, from his article in *Pharmacologist*, **26**, 31–36, 1984.

Commission & Committee News

Thin films on solids

Studies of thin films have contributed to the progress of both fundamental and applied research in colloid physical chemistry including very short range surface forces which stabilize colloidal systems and molecular ordering by surfaces observed in monolayers and multilayers.

The behaviour of thin films on solids is relevant to industrial applications such as ore flotation, solid surface protection, optical fibres and electronic display devices. Furthermore, the high degree of molecular structuring on relatively extended areas, displayed by the Langmuir–Blodgett solid multilayers, has potential applications in microlithography, in the storage of electric and optical information and in energy conversion processes. These potential applications have recently stimulated an increasing number of studies on solid thin films.

The Commission on Colloid and Surface Chemistry including Catalysts (I.6) feels that there is a need for a general manual on thin films on solids including their preparation and characterization. At the General IUPAC Assembly in Lyon in September 1985 the Commission formed a provisional working party which identified the following areas in thin film science where IUPAC action is needed:

- Solid films obtained by transferring monolayers.
- Thin wetting (liquid) films on solids.
- This solid or liquid films between solids, and disperse system stabilization.

Comments on this work and suggestions for future developments are welcome and should be addressed to the Working Party Coordinator: Lisbeth TER-MINASSIAN-SARAGA, Chimie et Biochimie Pharmacologiques et Toxicologiques, 45, rue des Saints-Pières, 75270 Paris Cedex 06, France.

L. Ter-Minassian-Saraga

New Green Book progresses

A Commission I.1 task group met in Dubrovnik, Yugoslavia early in March to continue its work on the new edition of the Green Book. The book, entitled *Quantities, Units and Symbols in Physical Chemistry*, is now approaching its final form. It will go before IDCNS for their approval later this year and hopefully it will be printed and available at the Boston General Assembly in 1987.

The process of preparing and editing the new draft began in Lyngby in 1983, and has included many meetings both within the task group and with members of other commissions of the Physical Chemistry Division. The new manual will maintain



The Commission I.1 task group in Dubrovnik.

the high standards of previous editions, but the contents have been considerably revised and extended. The revisions cover all the recent changes in the recommendations of the Conférence Générale des Poids et Mesures (CGPM), the International Standards Organization (ISO), and the International Union of Pure and Applied Physics (IUPAP). The extensions include important parts of the numerous appendices to the earlier editions. The style of the manual has also been slightly changed from being a book of rules towards being a manual of advice and assistance for the day-to-day use of practising scientists. Examples of this are the inclusion of brief definitions and SI units in the well-known tables of physical quantities and their symbols. Extensive explanatory footnotes and text, and other utilities such as examples of the use of quantity calculus, conversion tables between different units, a discussion of atomic units, and

tables of atomic weights and properties of the nuclides are also included.

The group has been working on the "Abbreviated List of Physical Quantities used in Chemistry". This is a four-page summary of the Green Book which, hopefully, will be made widely available at a low price for the use of students of chemistry all over the world. This is now in its final form, ready for publication in the summer.

Klaus Homann and Ian Mills

First Chemical Database Meeting

The first meeting of the Committee on Chemical Databases was held in Paris, France, 3–4 February this year. It was mostly concerned with organization and policy. The committee will be involved in the development of computer-readable databases. It will work on creating machine-readable representation of chemicals in the various databases, developing a data dictionary to help define what is in the database, and a glossary of computer terms directed towards chemists.

A number of candidate databases were examined. An electrical conductance data for solutions database is the first project on which the committee will work. A number of educational activities, in addition to the glossary, will also be undertaken. These will include the preparation of an article on computers in chemical structure representation and online databases.

The next meeting will be held in Frankfurt, Germany, 11–12 December 1986.

S. R. Heller

Provisional Recommendations

IUPAC seeks your comments

All comments on these recommendations are welcome and will be taken into consideration. The final revised versions are published in *Pure and Applied Chemistry* and synopses of these published in *CI* as recent reports. If you would like to comment on the provisional recommendations please write to your nearest regional centre requesting a copy of the full report. Copies are not available from the Secretariat. The most up-to-date list of regional centres appeared in *CI*, No 3, p 28 (1986).

Nomenclature, symbols, units in spectrochemical analysis: Part X. Preparation of materials for analytical atomic spectroscopy

The preparation of materials prior to spectrochemical analysis is an important and specialized step in the determination of elements, especially

where these are at trace levels. This document details the recommended terminology for describing the sampling and preparation of materials for such analyses. Explanatory diagrams of the sampling stages and illustrative examples of the routes from initial sample to the final spectrochemical analysis are also presented.

Comments on the report are welcome and should be sent before 28 February 1987 to Dr A. M. Ure,

Nomenclature, symbols, units in molecular absorption spectroscopy: Ultraviolet and visible

This report is 7th in the series on Spectrochemical Methods of Analysis issued by IUPAC Commission V.4. It is concerned only with absorption spectra obtained by measuring the transmittance of light through a sample as a function of wavelength. Other techniques such as photoacoustic methods or reflectance measurements will be considered in later reports. The present report has four main sections (a) terms relating to absorption processes, (b) instrumental factors, (c) measuring techniques, and (d) factors influencing precision and accuracy.

Although absorption spectroscopy has been used for chemical analysis for well over 100 years, there are still many inconsistencies in terminology in the published literature. The American Chemical Society (ACS) has, in its journal *Analytical Chemistry*, suggested nomenclature for absorption spectroscopy for papers published by ACS. It should be noted that some IUPAC recommendations differ from these and furthermore include terms such as double-wavelength, difference and derivative spectroscopies which are not considered in the ACS report.

Comments on the report are welcome and should be sent before 31 January 1987 to Prof. Dr M. Zander, Rütgerswerke AG, Postfach 504, Kekuléstrasse 30, D-4620 Castrop-Rauxel, Federal Republic of Germany.

Names for hydrogen atoms, ions, and groups, and for reactions involving them

These names comprise *general* names, to be used without regard to the nuclear mass of the hydrogen entity, either for hydrogen in its natural abundance or where it is not desired to distinguish between the isotopes, and *specific* names pertaining to specific isotopes.

	General	¹ H	² H	³ H
The atom (H)	hydrogen	protium	deuterium	tritium
The cation (H ⁺)	hydron	proton	deuteron	triton
The anion (H ⁻)	hydride	protide	deuteride	tritide
The group (-H)	hydro	protio	deuterio	tritio
Transfer of the cation to a substrate	hydronation	protonation	deuteronation	tritonation
Replacement of hydrogen by a specific isotope		protiation	deutriation	tritiation

Nomenclature of sampling in analytical chemistry

A 'sample' is defined as 'a portion of material selected in some manner from a larger quantity of material'. The term 'sample' should be used only when the analytical result obtained on the small portion is merely an estimate (in the statistical sense) of the amount or concentration of a constituent or property of the parent material, i.e. a 'sampling error' exists. The hierarchy of terms used for the progression of operations from the receipt of the laboratory sample to obtaining the final result would be: laboratory sample (the material received); test sample (the prepared laboratory sample); test portion (the amount measured for analysis); test solution (the dissolved test portion); treated solution (the test portion after reaction or separation procedures); test measurement (reported value). Once a test portion (not a 'sample') has been removed from the test sample, the term 'sample' would no longer be appropriate.

Recommendations have also been made regarding: (i) samples over which the chemist has no control; (ii) differences in concepts between sampling from bulk materials and from packaged materials; (iii) sampling under static conditions (e.g. a pile of coal) and under dynamic conditions (e.g. a flowing stream); and (iv) discontinuation of the use of the term 'bulk sample' in favour of 'composite sample' or 'aggregate sample'.

Comments on the report are welcome and should be sent before 31 March 1987 to the Secretary of Commission on Analytical Nomenclature, Dr C. L. Graham, Haworth Building, Department of Chemistry, University of Birmingham, POB 363, Birmingham B15 2TT, UK.

Comments on the report are welcome and should be sent before 31 March 1987 to the Secretary of the Commission on Physical Organic Chemistry, Dr R. A. Y. Jones, School of Chemical Sciences, University of East Anglia, University Plain, Norwich NR4 7TJ, UK.

Chemical Data Series

During 1985 three volumes were added to the IUPAC Chemical Data Series. Volume 30 contains data on the alkali metals, Volume 31 data on chlorine and Volume 32 the enthalpies of vaporization of organic compounds.

Handbook of Thermodynamic and Transport Properties of Alkali Metals

The application of alkali metals in science and industry has progressed rapidly since the first *Liquid Metals Handbook* of Lyon in 1952. Since then selected data have been given in Gmelins *Handbuch der Anorganischen Chemie* (1966), Hultgren's *Selected Values of the Thermodynamic Properties of the Elements* (1973) and Vargaftik's *Tables on the Thermophysical Properties of Liquids and Gases* (1975). The *Sodium-NaK Handbook* of Foust (1979, literature up to 1968) satisfied as a supplement to the Liquid Metals Handbook the requirements in the specialized field of the Liquid Metals Fast Breeder Program.

Excellent technical characteristics such as heat transfer and nuclear properties, large heat capacities, low vapour pressures and melting points, make alkali metals prime candidates in advanced technologies. This has encouraged universities and research organizations to study the thermodynamic and transport properties. A large amount of new experimental and theoretical data have been published in recent years.

It was therefore an urgent necessity and obligation towards the engineer and research scientist to provide an up-to-date compilation and assessment of data in easily accessible form and to critically review model calculations and data prediction. To achieve this goal a Task Force on Alkali Metals was formed within Commission II.3 on "High Temperature and Solid State Chemistry" of the Inorganic Chemistry Division of IUPAC. More than 130 scientists were contacted. Suggestions, criticisms and proposals were processed and adopted where possible.

A selection of thermodynamic and transport properties of top interest to the scientific and engineering communities was made. To ensure a systematic treatment of experimental and theoretical data the subdivision was chosen according to properties rather than elements. The property subdivision allows not only a self-contained expert treatment of each property, but in addition the

analysis of systematic trends within the group of alkali metals, and it avoids a scatter of theoretical and experimental data of one property throughout the handbook. The handbook has been subdivided into nine sections including 60 chapters written as a worldwide endeavour by 80 experts in the field with best qualifications on the subject. For optimum use a uniform homogeneous outline was aimed at in each data chapter, including a summary of the experimental and theoretical methods, an assessment of the measured and predicted data in tabular display, and empirical equations and graphical representations to emphasize deviations and allow comparison between data sets.

The importance of critical data evaluation, the necessity for internal consistency and a summary of units and conversion factors are presented as introductory parts. The first four sections give the theoretical background, the basic relationships (section 1), the theory of liquid metals (section 2), an introduction into technological applications especially in energy production (section 3), and the description of methods of preparation and analysis of high purity samples (section 4). An introduction into present and potential applications of alkali metals in industry will help to encourage and stimulate further research and development. The five data sections are concerned with structural (section 5), thermodynamic (section 6), and transport properties (section 7), solution of non-metals in alkali metals (section 8) and alkali metal alloys (section 9). Sections 8 and 9 were added since the properties of alkali metal alloys and solutions of gases in pure liquid metals are important for studies in metallurgy, corrosion and catalysis.

Internal consistency of thermodynamic data has been checked in chapter 6.4. In spite of a careful analysis performed throughout the Handbook each author remains responsible for completeness and reliability of the data presented. A complete list of references to original publications, wherever possible up to 1984, is added to each chapter.

The technological importance of a complete set of high precision data for the engineer and its requirement for the theoretician to test model calculations and predictions will certainly give strong motivation for more experimentation in this challenging area of alkali metals research.

Chlorine: International Thermodynamic Tables of the Fluid State

The Thermodynamic Tables Project was inaugurated in 1963 by the Commission on Thermodynamics and Thermochemistry of the Division of Physical Chemistry with the object of compiling internationally agreed values of the equilibrium thermodynamic properties of liquids and gases of interest to both scientists and technologists. The range to be covered for each fluid is that for which there exist reliable experimental data, and the agreed values will be issued as tables upon the basis of which users may produce equations suited to their own special requirements, if the wide-ranging equations given are not appropriate for their purposes. Tables on argon, ethylene, carbon dioxide, helium, methane, nitrogen and propylene have already appeared based on these principles.

It became evident that there are a considerable number of important fluids for which the existing data, and any data which can be expected in the foreseeable future, are not adequate to form the basis of extensive tables using the above criteria. So, from time to time, volumes are produced when it is felt that a combination of data and estimation can be used to construct tentative tables which are an improvement on those currently available. These tables for chlorine are the first such tentative tables.

The reactive nature of chlorine has led to it becoming one of the most widely used of all chemicals and industry continually finds new uses for its reactivity. The principal uses of chlorine are in operations performed at atmospheric pressure such as sanitation and bleaching but the fastest growing use is in the preparation of organic compounds for plastics and polymers which involve the use of chlorine at pressures and temperatures other than ambient. A hindrance to this growth is the lack of confidence in existing tables of the thermodynamic properties and the unreliability of most of the available data.

A critical review of the available experimental data reveals that the only properties for which accurate data exist are vapour pressures up to a pressure of 0.33 MPa, and density measurements over restricted ranges in the gas and liquid phases. From these data it was not possible to prepare tables of the standard of previous publications by the IUPAC Thermodynamic Tables Project.

Despite the paucity of experimental data, at least eighteen tables of the properties of chlorine have

The book which is Volume 30 of the Chemical Data Series was edited by Roland W. Ohse and published by Blackwell Scientific Publications Ltd, Oxford, UK, 1985 xxxii + 987 pp, price in UK £100, overseas US-\$120, ISBN 0 632 01447 4.

been published since 1949, of which only four are based on an examination of the experimental data available at the time of compilation. All other tables are either a reworking, with possible extension, of these four studies, or are based on an uncritical acceptance of data. The basis of all these tables is the experimental work of Pellaton, which was published in 1915, and though of good quality for that time, it has been used largely because there was no alternative.

In the circumstances it seemed useful for the IUPAC Project to relax its usual criteria and, by using predictive methods to supplement the few reliable experimental data, produce tables over a wider range than is allowed by the experimental data.

The two predictive methods used resulted in a lower level of accuracy than the use of experimental measurements and the resulting tables must be regarded as tentative. It cannot be stressed too strongly that there is, as yet, no accurate substitute for experimental data and it is hoped that the analysis of the data presented in this book, and the limited confidence that it is possible to have in the estimation procedures described will together convince readers of the necessity of an experimental programme outlined in this book. However, the tentative tables are thought to be of higher accuracy than previous tables and will be valuable to industry until the necessary experimental work is carried out.

Sections 1 and 2 of the text of this book are concerned with the discussion of the available data and estimated data, respectively. The way in which the equation of state, $P(\rho, T)$, was constructed from them is dealt with in section 3. Section 4 explains how the tabulated properties were calculated from the chosen equation. In addition, the data and equations correlating them are discussed for the saturation curve.

The tables presented here give the volume, entropy, enthalpy, isobaric heat capacity, compression factor, fugacity/pressure ratio, Joule-Thomson coefficient, ratio of the heat capacities and speed of sound as a function of pressure and temperature; and the pressure entropy, internal energy and isochoric heat capacity as functions of density and temperature, for the gas and liquid states from 0.025 to 25 MPa at temperatures from 180 to 900 K. Zero pressure tables are given, as are

the tables of the properties of the fluid phases along the saturation curve.

Equations which reproduce these properties within these limits are given, as well as estimates of uncertainty of some of the principal properties listed.

This book, which is Volume 31 of the Chemical Data Series is published by Pergamon Press, Oxford, UK, 1985, xviii + 161 pp, price UK £30.00, overseas, US-\$47.50, ISBN 0 08 030713 2.

Enthalpies of Vaporization of Organic Compounds: A Critical Review and Data Compilation

This book is a result of a project of the IUPAC Sub-Committee on Thermodynamic Tables performed at the Department of Physical Chemistry of the Prague Institute of Chemical Technology. The purpose of the project was to collect and critically evaluate all calorimetrically determined data on the enthalpy of vaporization of organic compounds, to generate a set of recommended values, and to evaluate standard enthalpies of vaporization and cohesive energies. Every effort was made to furnish maximum amount of information on the origin of experimental data, their reliability and consistency, experimental techniques and the data treatment. Besides the recommended values with accuracy estimates, the tables list all the direct experimental values with relevant comments. Also included is a survey of calorimetric techniques which have been used to determine ΔH_v .

The work on the project started at the beginning of 1981 and in summer 1983, a preliminary version of the manuscript was submitted to IUPAC Sub-Committee on Thermodynamic Tables for international reviewing. A final version, amended according to reviewer's suggestions and sup-

plemented with latest measurements, was completed in spring 1984, and a camera-ready copy was produced in the winter of 1984/85.

The authors have followed, in general, the terminology and symbols recommended by the IUPAC in the following publications: *Manual of Symbols and Terminology for Physicochemical Quantities and Units* (1979) and two Reports of IUPAC Commission I.2 on Thermodynamics (1981, 1982). However, some minor deviations from the latest IUPAC recommendations have been introduced in order to achieve maximum simplicity in the notation. Specifically, the symbol for vaporization is "v" instead of the recommended "vap", and the saturated vapour (or gas) and liquid are indicated by "g" and "l", respectively, used as superscripts. The guide in choosing the nomenclature has been the IUPAC publication *Nomenclature of Organic Chemistry* (Rigaudy & Klesney, 1979). Further information is given at the head of the Name Index. The molar masses included in the tables are based on atomic masses as revised at 32nd IUPAC General Assembly in Lyngby (1983).

The IUPAC Commission on Thermodynamics (I.2) has recommended that tabulated thermodynamic data should relate to a standard pressure of 10^5 Pa instead of the traditional 1 atm (101 325 Pa). This alternative has no consequence upon the values tabulated herein. With regard to the normal boiling temperatures, the Commission specifically recognized that these are excluded from the recommendation. Therefore, the original convention of referring the values to the saturated vapour pressure of 101 325 Pa has been followed in the tables. The issue of the standard-state pressure has been discussed in detail by Freeman (1982).

The book, which is Volume 32 of the Chemical Data Series, is published by Blackwell Scientific Publications Ltd, UK, 1985, 300 pp, price UK £28, overseas, US-\$36, ISBN 0 632 01529 2.

Recent Reports

In this section we publish summaries of the most recent IUPAC Recommendations on Nomenclature and Symbols and Technical Reports. The full texts of these recommendations and reports are published in *PAC*.

The absolute electrode potential: an explanatory note (Recommendations 1986)

The document begins with the illustration of the most widespread misunderstandings in the literature about the physical meaning of absolute

electrode potential. The correct expression for this quantity is then derived by a thermodynamic analysis of the components of the emf of an electrochemical cell. It is shown that *in principle* three reference levels can be chosen to measure an absolute value of the electrode potential. Only one of these possesses all the requisites for a meaningful comparison on a common energy scale between electrochemical and physical parameters. Such a comparison is the main problem for which the adoption of a correct scale for absolute electrode potentials is a prerequisite. The document ends with the recommendation of a critically evaluated value for the absolute potential of the

standard hydrogen electrode in water and in a few other protic solvents.

This report was prepared by the Commission on Electrochemistry (I.3) and was published in PAC, Vol. 58, No. 7, pp. 955–966 (1986).

Reporting data on adsorption from solution at the solid/solution interface (Recommendations 1986)

This document is a companion to that on Reporting Physisorption Data for Gas/Solid Systems, and is designed to supplement the discussion of adsorption at the solid/solution interface given in the Manual of Symbols and Terminology for Physicochemical Quantities and Units, Appendix II, part 1: Definitions, Terminology and Symbols in Colloid and Surface Chemistry, *PAC*, Vol. 31, pp. 579–638 (1972), Section 1.1.10.

The definitions of adsorption from solution used here are essentially those adopted in the Manual. A discussion is then given of the operational determination of adsorption from solution, and includes an outline of various available experimental techniques, and recommendations concerning the precautions which need to be taken to ensure reliable results. Recommendations are made regarding the form in which results should be published.

The interpretation of adsorption data in thermodynamic terms is discussed as is the role of adsorption models in elucidating the molecular processes involved in adsorption. Attention is also drawn to the problems associated with the effects of surface heterogeneity on adsorption from solution.

This report was prepared by the Commission on Colloid and Surface Chemistry including Catalysis (I.6) and was published in PAC, Vol. 58, No. 7, pp. 967–984 (1986).

Impact testing of polypropylene mouldings

Nine differently laboratories have collaborated in a research programme on factors affecting the fracture resistance of injection-moulded polypropylene plaques, as measured in the dart impact test. The principal factors investigated were the presence of weld lines and ejector pin marks, and the fracture surface energy G_{IC} of the polypropylene. A comparison was made between a homopolymer and a copolymer (rubber-toughened) grade. It was found that the copolymer had the higher fracture surface energy at 23°C but gave a lower G_{IC} than the homopolymer at –40°C, where the extent of crack-tip yielding was reduced. The weld line constituted an important defect which lowered the dart impact

strength, especially when the weld was formed by melt fronts meeting head-on. However, there was no detectable effect of the weld in notched specimens. It is concluded that weld lines act essentially as surface defects. Ejector pin scars, which clearly are surface defects, also significantly reduce dart impact strength.

This report was prepared by the Commission on Polymer Characterization and Properties (IV.2) and was published in PAC, Vol. 58, No. 7, pp. 985–998 (1986).

Application of fracture mechanics to the prediction of the ductile–brittle transition

Eleven different laboratories have collaborated in a research programme on factors affecting the fracture resistance of injection-moulded plaques, as measured in dart impact tests. Factors investigated were the presence of weld lines and ejector pin marks, the test temperature and the yield stress σ_y and fracture toughness K_{IC} of the polymer over a range of temperatures. Materials studied were high-density polyethylene (HDPE), nylon 66 (PA66), and two grades of polypropylene (PP), a homopolymer and a copolymer. A fracture mechanics analysis showed that welds formed in PA66 by head-on impingement of melt fronts behaved like surface cracks of length 250 μm . Polarized light microscopy revealed the presence in the PA66 mouldings of a distinctive layer of large spherulites running normal to the surface to a depth of 500 μm . This weld-line defect structure was associated with low-energy fractures in the dart impact test on PA66 plaques. Correlations between weld-line defects and low impact energy were also observed in HDPE and PP. Large defect sizes, low K_{IC} , and high σ_y all contributed to brittle fracture.

This report was prepared by the Commission on Polymer Characterization and Properties (IV.2) and was published in PAC, Vol. 58, No. 7, pp. 999–1014 (1986).

Quantitative characterization of procedures using ultraviolet and visible molecular absorption spectrophotometry

This paper gives information on the characterization of spectrophotometric methods of determination. The proposed characteristics should be helpful for practising analysts to select the most suitable photometric reagent or procedure for a particular problem from the vast number of substances and procedures recommended in the literature.

Three main groups of characteristics are pro-

posed: (1) characterization of the reagent (purity, spectral properties, stability of reagent in solution, etc.); (2) optimal conditions for the procedure (pH, buffer used, recommended wavelength, conditional molar absorptivity, etc.); (3) characteristic parameters of the procedure (working range, equation of the calibration plot, sensitivity, precision, interferences, etc.). Particular attention is given to means of comparing different reagents and procedures and of characterizing interfering species and their effects.

A further objective of the present discussion is to encourage a reduction in the number of new publications on spectrophotometric reagents with little or no practical importance which can be evaluated by means of the proposed characteristics.

This report was prepared by the Commission on Analytical Nomenclature (V.3) and was published in PAC, Vol. 58, No. 7, pp. 1015–1022 (1986).

Determination of erythrodiol in vegetable oils

The development, by collaborative study, of a standardized method for the determination of the erythrodiol content of vegetable oils is described. The procedure involves the isolation of the unsaponifiable matter in the oil, its purification by column chromatography and fractionation by thin-layer chromatography. The silanized fraction containing the erythrodiol is then analysed by gas-liquid chromatography and quantitative assessment made by reference to beta-sitosterol or by use of an internal standard (betulin).

This report was prepared by the Commission on Oil, Fats and Derivatives (VI.3) and was published in PAC, Vol. 58, No. 7, pp. 1023–1034 (1986).

Application of multiresidue procedures in pesticides residues analysis

The fields of application of multiresidue procedures and the proper selection of compounds and samples to be analysed are discussed. The various processes of well-established multiresidue procedures are reviewed and critically assessed in order to give guidance for the analysis of compounds being not included in current methods and to help laboratories to improve their own methodology.

This report was prepared by the Commission on Pesticide Chemistry (VI.5) and was published in PAC, Vol. 58, No. 7, pp. 1035–1062 (1986).

Determination of total selenium in lyophilized human blood serum

An interlaboratory cooperative study was conducted, to determine total selenium (Se) in two lots of a commercially-available (Seronorm) lyophilized human blood serum. The main objective was to arrive at consensus concentration values in order to establish control sera for chemical analysis. A secondary goal was to assess the performance of different analytical methods as applied to the analysis of serum specimens with normal concentrations of Se, i.e. about $100 \mu\text{g l}^{-1}$. Twenty-seven laboratories worldwide participated in the trial using six inherently different analytical methods: (1) fluorometry, (2) electrothermal atomization atomic absorption spectrometry with or without sample pretreatment, (3) neutron activation analysis (instrumental or with radiochemical separation), (4) hydride generation atomic absorption spectrometry, (5) isotope dilution mass spectrometry, and (6) X-ray fluorescence spectrometry. For this population of laboratories, methods (2) and (4) exhibited the largest systematic differences in concentration. Based on about 100 analyses from 18 laboratories using techniques (1), (2), (3), (5) and (6) the following mean Se concentrations $\pm$ a 68% confidence interval for one future observation were found — Seronorm 102: $91 \pm 7 \mu\text{g l}^{-1}$; Seronorm 103: $93 \pm 7 \mu\text{g l}^{-1}$. It is hoped that this information will lead to the establishment of these sera as quality control materials useful to clinical and other laboratories measuring Se in serum matrices.

This report was prepared by the Commission on Toxicology (VII.4) and published in PAC, Vol. 58, No. 7, pp. 1063–1076 (1986).



A History of the Nomenclature of Organic Chemistry

Prof. Pieter Verkade (1891–1979) was Emeritus Professor, Delft University of Technology, Netherlands; Chairman of the IUPAC Commission on Nomenclature of Organic Chemistry (1934–71) and President of the Organic Division (1955–59). Last year the English translation of his book *A History of the Nomenclature of Organic Chemistry* was published.* In two separate accounts Dr Kurt Loening, Chairman of the IUPAC Interdivisional Committee on Nomenclature and Symbols (IDCNS) and the editors of the book review the book and describe the life and work of the author.

Laying to rest misconceptions

While the importance of organic chemical nomenclature is generally recognized, the subject does not generate much interest among practising organic chemists. It is frequently regarded as a necessary evil, a set of restrictions imposed by referees and journal editors to keep at least some order in the primary literature and to facilitate communication and retrieval of information. This lack of interest and consequent lack of participation in the formulation of organic nomenclature recommendations by the chemical public is unfortunate because, after all, when recommendations dealing with the language of organic chemistry are prom-

ulgated, all chemists are affected by them to at least some extent.

In my opinion, some of this apathy is due to the fact that nomenclature recommendations such as those issued by IUPAC only state the procedures to be followed, without giving the background and reasoning behind them. Thus, in the public's mind these recommendations are formulated in an arbitrary manner by a group of specialists in organic nomenclature as opposed to practising organic chemists.

"the subject is not dull . . . international decisions have not been arrived at arbitrarily and in a vacuum, but most of the time only after long discussions, careful studies, and practical compromises."

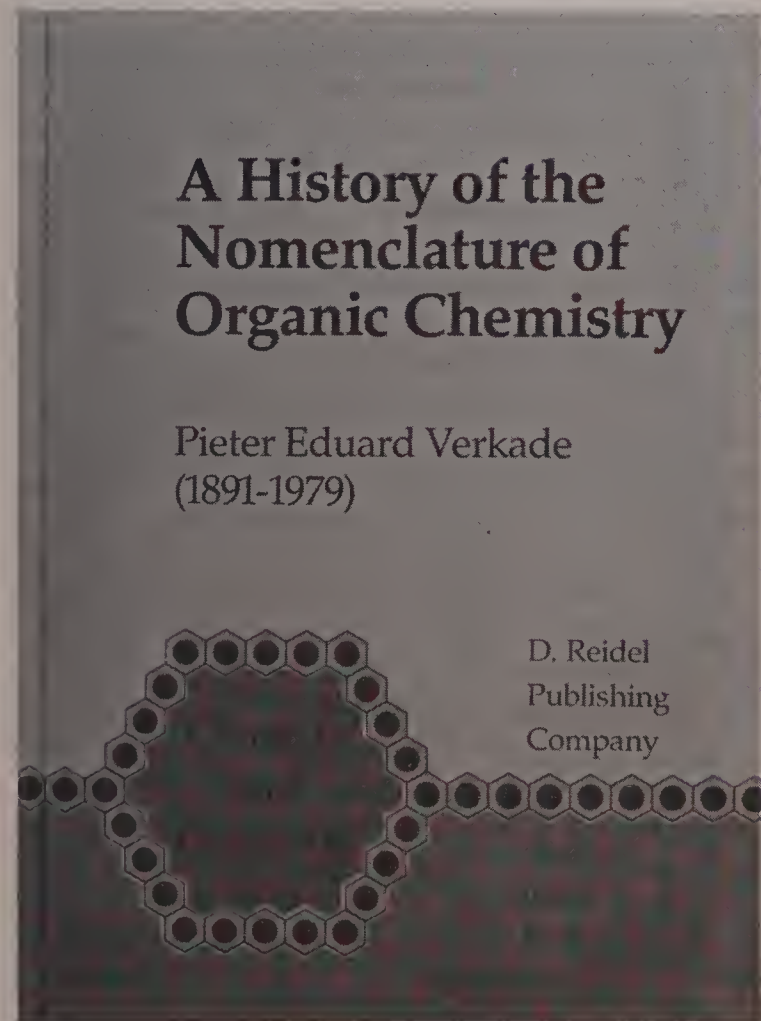
This book should lay to rest these misconceptions and remedy the lack of background information given in the IUPAC recommendations. Prof. Verkade's recording of the history of organic nomenclature clearly shows that the subject is not dull and that international decisions have not been arrived at arbitrarily and in a vacuum, but most of the time only after long discussions, careful studies, and practical compromises. Moreover, the history is sprinkled with the names of famous organic chemists, such as Bouveault, Friedel, Grignard, and Tiemann; this illustrates the participation of some of the giants of organic chemistry in

*A History of the Nomenclature of Organic Chemistry by Pieter Eduard Verkade (1891–1979) was originally published as *'Etudes Historiques sur la Nomenclature de la Chimie Organique'* in Bulletin de la Société chimique de France, Paris, and translated from the French by Dr S. G. Davies (University of Oxford, UK). The English translation is published by D. Reidel Publishing Company, Dordrecht and Delft University Press, The Netherlands, 1985. Eds: F. C. Alderwireldt, H. J. T. Bos, L. Maat, P. J. Sloodmaekers and B. M. Wepster. xiv + 507 pp. ISBN: 90 277 1643 9. Price: Cloth Dfl.220.00/US-\$89.00/£55.95.

A History of the Nomenclature of Organic Chemistry

Pieter Eduard Verkade
(1891-1979)

D. Reidel
Publishing
Company



nomenclature matters. Indeed, Verkade himself proves the point. Although so very active in organic nomenclature for over fifty years, he also had a most productive career in organic research and teaching.

I cannot think of anyone more qualified than Pieter Verkade to have written this history of systematic organic nomenclature which is only about a hundred years old. He was a member of IUPAC's Commission on the Nomenclature of Organic Chemistry for 44 years (1927–71) and its chairman for 37 (1934–71). I first met him at the 1961 Commission meeting in Columbus, which I attended as an observer. He was a stern taskmaster, requiring Commission members to work long hours. I was impressed by the fact that he was always in control of the discussion, although surrounded at the table by a number of strong and vocal personalities. His devotion to the creation of a good organic nomenclature was well respected and is demonstrated by the accomplishments of the IUPAC Organic Nomenclature Commission under his leadership. We became good friends and worked together for the next 18 years until the year of his death, 1979.

The 16 studies in this book appeared in French over a span of 13 years in the *Bulletin de la Société chimique de France*. Verkade undertook this work upon his retirement from the University of Delft. The decision to publish in French was partly at the urging of G. Kersaint, a French member of the Commission and a good friend, and partly because of Verkade's feeling that it was the thing to do in view of the importance of French chemists and the French language in the early days of organic nomenclature.

Kurt L. Loening

A monumental document

Pieter Eduard Verkade was born in 1891 in Zaandam.¹ After his studies at the Delft University of Technology he obtained his PhD degree under Prof. J. Böeseken. In 1919 he became Professor of History of Commodities at the Nederlandsche Handels-Hoogeschool in Rotterdam where he was to serve three one-year periods as Rector Magnificus. From 1938 to 1961 he was Professor of Organic Chemistry at the Delft University of Technology.

Among his numerous and quite diversified research results we only recall here² the discovery of the ω -oxidation of fatty acids — still under investigation — and the related syntheses of glycerides and phosphatides; the sweetening agent P-4000, 2-amino-4-nitropropoxybenzene (5-nitro-2-propoxy-benzenamine), 4000 times sweeter than sugar and, as a derivative of this work, the study of steric inhibition of resonance.



Prof. Pieter Verkade
who was devoted to
the creation of good
organic
nomenclature.

Meanwhile, he was a member of the Editorial Board of the *Recueil des Travaux chimiques des Pays-Bas* for 20 years, 8 of them as its Chairman. He was also active in the Koninklijke Nederlands(ch)e Chemische Vereniging³ (KNCV), from 1930–33 as President. Earlier, in 1925, he had been one of the founders of its Section of Organic Chemistry, becoming its first chairman. Later, from 1955–59, he acted as President of IUPAC's Section of Organic Chemistry. He was admitted to Honorary Fellowship of the KNCV in 1958. In 1936 he had been elected member of the Koninklijke Nederlandsche Akademie van Wetenschappen.

As to the making of nomenclature. Verkade enters in 1922 as delegate to Council at the meeting of the Working Party of the Commission for the Reform of Nomenclature presided by Holleman, at a time when the Geneva Rules of 1892 still govern the naming in organic chemistry. The young man meets some of the founders and other big names in nomenclature and is duly impressed though not overawed by chemists like Armstrong, Grignard, Patterson, Pope. Votoček. In 1927, when Holleman is unable to attend the meetings of the Subcommittee on Organic Chemistry, Verkade replaces him and also presides at the meetings. In 1934, he officially becomes the successor to Holleman and he will resign this chairmanship only in 1971 at the age of 80. In this period the general basis of present-day nomenclature is laid down in definitive versions of the Sections A, B, and C of the IUPAC Rules, and the Sections D and E are getting well on their way to completion. In recognition of these extensive and basic contributions to the documentation of chemistry, the American Chemical Society presented Verkade with the Austin M. Patterson Award in 1973.⁴

The success of such a long spell of activity calls for explanation — it can be found in some of Verkade's outstanding qualities. He was not only a good organic chemist, he was also extremely

punctilious in his work and his writings. He had an exceptionally good memory and a well-developed sense of language and semantics. His most important capabilities in this context, however, were those elegantly and succinctly honoured by Cahn⁵ when dedicating the fourth Edition of his *Introduction to Chemical Nomenclature* (1974) to "Verkade . . . who by tact and persistence shepherded the (IUPAC) Commission through its national divergencies to ultimate agreements".

In 1961, Verkade had to resign from the University. As a "young and dynamic Professor Emeritus" he remained active as Chairman of the IUPAC Commission for the Nomenclature of Organic Chemistry, and completed his chemical research in about 40 publications. Furthermore, he availed himself of the opportunity of participating in the mixed Flemish–Dutch Commission for the Nomenclature of Organic Chemistry. There, he contributed vigorously and enthusiastically to the Dutch editions of the international IUPAC Rules until a few months before his death. He was of enormous help not least because he recalled, for all the rules, who had written them, in what year, and why. In this period too he started composing his sixteen memoirs on the history of the nomenclature of organic chemistry.

The original manuscripts of this series were written by hand with a fountain pen, penknife and magnifying glass at hand, in a mixture of Dutch and French. The handwriting takes some experience and a lot of patience to decipher. These manuscripts went to a typist, back to the author for refinements, then to one of the several translators — depending on the source of financial support⁶ — and, finally, after further corrections and re-typing, to the *Bulletin de la Société chimique de France*. The editors always accepted the sometimes lengthy papers, aware that they were thus able to save these invaluable testimonies for posterity.

A major reason for writing in French was that the beginning of systematic nomenclature had been a French affair. In 1787, Lavoisier and some of his pupils were the first to propose a systematic nomenclature in their *Méthode de Nomenclature Chimique*. The Geneva Rules had been initiated and prepared by French chemists under the presidency of Friedel and followed up at the Saint-Etienne Meeting in 1897. In addition, Verkade grew up in a time when French was still the first foreign language in the Netherlands. Thus, French was the language of choice.

Although Verkade was aware that, in our multilingual world, not everybody was well enough acquainted with French to appreciate all the facets of the historical details, he initially waved away this drawback rather optimistically. In later years that optimism dwindled, but he could never decide upon abandoning the use of the language he

considered so eminently suitable for the purpose. Deploring that many are not as well versed in French as his generation, he sometimes wished that the complete series had been written in English.

This book, which is a monumental document in its own right, is also a tribute to the nomenclaturists, of which Verkade was second to none. It certainly belongs next to the *Blue Book*⁷ in the library. At the same time we feel it to be the best remembrance of Verkade, because it contains so many of the characteristic traits of the man himself. When reading the studies we hear Verkade lecture again and feel admiration for the work done. It is realization of Verkade's adage "The history of science is the history of its practitioners".

**F. C. Alderweireldt, H. J. T. Bos, L. Maat,
P. J. Sloodmaekers and B. M. Wepster**

References

1. For biographical data see several contributions in *Chemisch Weekblad* **57** (1961) 353–370; L. Maat and B. M. Wepster, *ibid.* **75** (1979) Oct. 12, 2; F. C. Alderweireldt, H. J. T. Bos, J. J. Jennen, L. Maat, J. Nys, and P. J. Sloodmaekers, *Chemie Magazine* **5** (8) (1979) 24–25; W. G. Burgers, *Versl. Gewone Vergad. Afd. Natuurkd. K. Ned. Akad. Wet.* **88** (8) (1979) 94–96; B. M. Wepster, *Jaarboek van de Koninklijke Nederlandse Akademie van Wetenschappen* 1979, pp. 172–177.
2. A complete bibliography can be found in *Chemisch Weekblad* **57** (1961) 370–376 and *ibid.* **75** (1979), Oct. 12, 2–3.
3. Royal Netherlands Chemical Society.
4. See, e.g., H. J. T. Bos, *Chemisch Weekblad* **69** (1973) July 10, 9.
5. R. S. Cahn, *Introduction to Chemical Nomenclature*, 4th edn, Butterworths, London, 1974, p. IV.
6. Parts 3, 5, 7, 8 and 11 have been translated into French thanks to financial support from the Netherlands Organization for the Advancement of Pure Research, ZWO; other translations were paid by Koninklijke/Shell or Dutch State Mines.
7. *IUPAC Rules on the Nomenclature of Organic Chemistry, Sections A, B, C, D, E, F, and H*, 1979 Edition, Pergamon Press, Oxford etc., 1979.

Acknowledgement: The two accounts above were extracted from the Foreword and Introduction respectively of A History of the Nomenclature of Organic Chemistry by Pieter Eduard Verkade and reproduced by permission of Delft University Press.

Selenium in peptides

As selenium-containing peptides are studied, the need for agreed names and symbols for selenium-containing amino acids and peptides is increasing.

Names. We recommend the name "selenocysteine" for cysteine in which sulphur is replaced by selenium. One of the two meanings of the prefix thio- is replacement of oxygen by sulphur¹, and seleno- can similarly mean replacement of oxygen by selenium¹. It seems reasonable to extend its usage to cover replacement of sulphur, so that the amino acid may be named "selenocysteine", as opposed to the alternatives "selenoserine" and "hydroselenoalanine", which would adhere more strictly to the existing rules of organic nomenclature but would be likely to be more obscure in practice. [The name hydroseleno for the HSe-group¹ uses the term seleno in a different sense from that cited above.] The name selenocysteine has the advantages that (i) it is already widely used; (ii) cysteine is the biological precursor of selenocysteine; and (iii) selenocysteine is closer in properties to cysteine than to serine or alanine.

By extension, the prefix seleno may be applied to trivially named peptides such as glutathione to represent replacement of sulphur by selenium.

Symbols. We note that Günzler *et al.*² have used Sec and X as the three- and one-letter codes respectively, with appropriate definitions in the paper. This practice seems a useful addition to the existing symbols³, though we would recommend that authors take care to emphasize that this use of X is more specific than the existing use of X to represent an unknown or 'other' amino acid³. We thank Dr Günzler for bringing it to our attention.

Any comment?

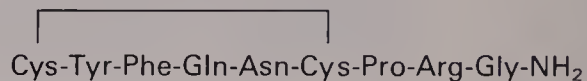
This report on biochemical nomenclature is extracted from *Newsletter 1986* prepared by the Nomenclature Committee of the International Union of Biochemistry (NC-IUB) and the IUPAC-IUB Joint Commission on Biochemical Nomenclature (JCBN). The newsletter was published in full in *Eur. J. Biochem.* Vol. 154, pp. 485–487 (1986).

Comments on any item in this Newsletter, or any other aspect of biochemical nomenclature, may be sent to any member of the nomenclature committees, or to their secretary, Dr A. Cornish-Bowden, Department of Biochemistry, University of Birmingham, PO Box 363, Birmingham B15 2TT, England.

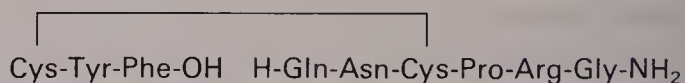
Use of seco- in partially hydrolysed peptides

De Haën *et al.*⁴ have used the prefix [seco-*m/n*] attached to the name of a peptide to indicate the derivative obtained by hydrolysis of the bond between residues *m* and *n* of the peptide. This usage, for which they thank R. Schwyzler, seems to be a helpful extension to recommendations for describing modifications of named peptides³, and it may be illustrated by the following examples:

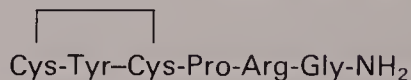
oxytocin



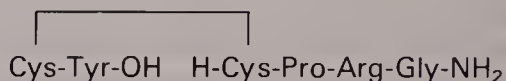
[seco-3/4]oxytocin



des-(3-5)oxytocin



des-(3-5)-[seco-2/6]oxytocin



The suggested use of the prefix seco- for peptides is slightly different from its use for other compounds. The bond cleaved in a peptide is replaced by OH and H; the bond cleaved in other compounds is replaced by two H atoms¹.

The second formula above contains the symbols -Phe-OH and H-Gln- for C- and N-terminal residues to emphasize that they are unsubstituted³ but they could equally correctly be represented as -Phe and Gln-. Similar emphasis is used in the fourth formula.

The need for a similar symbol to indicate hydrolysis that brings about ring opening rather than creation of two molecules may also exist for homodetic cyclic peptides, i.e. peptides such as gramicidin S in which the ring consists solely of amino-acid residues in eupeptide linkage. However, no system for dealing with these cases has been established, and we would caution biochemists that simple application of the prefix seco- as in heterodetic cyclic peptides such as oxytocin is inappropriate because there is no terminus in a homodetic cyclic peptide and hence no unambiguous way of numbering residues.

Glycoproteins

In new recommendations⁵ glycoproteins are defined as compounds that contain protein and

carbohydrate covalently linked. They include the proteoglycans, whose carbohydrates are glycosaminoglycans. Other terms defined in the recommendations are as follows:

asialo-:	a prefix to indicate removal of residues of sialic acid, whether by enzymic or acid treatment.
glycated:	combined with carbohydrate (not necessarily by glycosylation, and so not necessarily containing a glycosyl group).
glycopeptide:	a compound consisting of a carbohydrate linked to an oligopeptide (a peptide of up to about 20 residues).
glyco-amino-acid:	a compound consisting of a carbohydrate linked to an amino acid. (Note the hyphens, which are necessary to avoid implying that the carbohydrate is linked to the amino group.)
glycosaminoglycan:	polysaccharide containing residues of hexosamine. These usually alternate with residues of uronic acid, or natural sugar (usually galactose), or (for peptidoglycans only) muramic or hexosaminuronic acid, to form unbranched chains.

A shortened representation of oligosaccharide chains

Present recommendations⁶ specify two methods of representing oligosaccharide chains, an extended form and a condensed form. We now realize that the condensed form is unnecessarily long, and suggest that there should be no serious loss in shortening it further by (i) omitting locants of anomeric carbon atoms; (ii) omitting the parentheses around the specifications of linkage; (iii) omitting hyphens if desired.

The shortening may be illustrated by reference to a trisaccharide as follows:

extended form:	β -D-Galp-(1 $\rightarrow$ 4)- β -D-GlcNAcp-(1 $\rightarrow$ 2)-D-Man
condensed form:	Gal(β 1-4)GlcNAc(β 1-2)Man
short form:	Gal β 4GlcNAc β 2Man, or Gal β -4GlcNAc β -2Man.

The symbols for monosaccharides are given in ref. 6. The shortened representation is used in the new recommendations on glycoproteins⁵.

Serpins

Carrell and Travis⁷ have pointed out that it would be desirable to have a single short name for the homologous group of proteins (predominantly plasma proteinase inhibitors) that includes α_1 -antitrypsin, antithrombin III and ovalbumin, and

they have suggested calling the group the serpins (from *serine-proteinase inhibitors*). This proposal seems useful to NC-IUB and JCBN, and we therefore draw the attention of biochemists to it.

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Chemical Nomenclature, Symbols and Terminology for use in school science

IUPAC rules of nomenclature are intended to be suitable for textbooks, journals and patents, for lexicons and similar compilations, and for indexes. However, they are not exhaustive, except in specified cases. Where, for various reasons, limitation to a single method of nomenclature appears undesirable or impossible, alternatives are given. In 1969, the Association of Science Education (ASE) in the UK set up a Working Party to report on Chemical Nomenclature. The ASE considered that although progress was already being made in schools towards implementing the nomenclature rules of IUPAC there appeared to be a risk, at that time, of differing interpretations of the IUPAC rules. One reason was that IUPAC rules contain many refine-

ments whose scope and purpose are irrelevant at school level. There was also evidence that IUPAC rules were being applied incorrectly. The ASE therefore felt that there was a need to publish some guidance to help establish a uniform practice in schools.

The First Edition of this publication appeared in 1972 and was formally adopted in large measure by examining boards at the secondary level in the UK as the basis for the nomenclature used in setting examination papers. The ASE recommendations have since been adopted and assimilated at school level in the UK. They are now used in school textbooks and most suppliers of chemicals to

schools in the UK now include the recommended names of chemical substances on their own labels.

The Third Edition of this report was prepared by a Subcommittee of the ASE Education (Coordinating) Committee. It includes sections on physical chemistry; inorganic nomenclature; organic nomenclature; oxidation number; formulae and equations; new definitions of some physical units and a bibliography.

The report is available from the Bookselling Department, ASE, College Lane, Hatfield, Herts AL10 9AA, UK. 120 pp, 1985, ISBN 0 86357 013 5. Price £3.50.

SCOPE Report 26, SGOMSEC 2: Methods for Estimating Risk of Chemical Injury — Human and Non-human Biota and Ecosystems

This book, which is based on the second workshop conducted by SGOMSEC* held in Rome, 12–16 July 1982, provides a review and evaluation of existing methods for estimation and quantification of risks associated with chemical exposure. Dealing first with the assessment of probable damage to the human organism, the book discusses the basic mechanisms of mutagenesis and carcinogenesis, the validity of long-term whole-animal studies as predictors of human response and the use of epidemiology, statistics and mathematical modelling in developing quantitative risk estimation. The same approach is adopted for non-human biota and ecosystems, including a state-of-the-art assessment of work in single-species tests, multi-

species tests and ecotoxicological modelling. Where suitable methods are not available, inadequacies are identified and suggestions made for the improvement and development of more appropriate procedures to fill them.

The book will be of interest to scientific environmentalists, epidemiologists, toxicologists, ecotoxicologists, governments and other authorities protecting the environment from pollution, and organizations who assess risks from occupational exposures.

The book was prepared by SGOMSEC and edited by V. B. Vouk, G. G. Butler, D. G. Hoel and D. B. Peakall. It was published in 1985 by John Wiley & Sons Ltd, Chichester, UK, ISBN 0 471 90546 1.

SCOPE Report 27: Climate Impact Assessment — Studies of the Interaction of Climate and Society

This is the first comprehensive handbook of climate impact assessment. The growing climate consciousness, both popular and scientific, which began in the 1970s, was sparked by a series of extreme climate events and related disruptions, and by scientific speculation on increased climate variability and possible climate change. The pace and degree of change are under debate, but it is widely agreed that at least one change, a long-term global warming derived from the enrichment of the atmospheric content of the "greenhouse" gases, is underway. There is also emerging scientific consensus that human-induced alterations in the chemical constituents of the atmosphere can lead to large regional, and even global, changes of the

atmosphere in the form of more acidic rain and greater ultraviolet radiation.

Within the time period of the projected global average warming, sustained variations of climate will occur in many places, and lesser periods of favourable or unfavourable climate will occur in most places. Where these changes are very large — the extremes greater than usual — where people and places are vulnerable, or where human activity meshes poorly with natural opportunity, significant climate impacts are likely to occur. This book addresses the important issue of how to identify, study and respond to such impacts, i.e. adjusting to changing climate, coping with extremes and matching human needs to climate endowment.

*SCOPE Scientific Committee on Problems of the Environment

SGOMSEC Scientific Group on Methodologies for the Safety Evaluation of Chemicals

The book is edited by R. W. Kates, J. H. Ausubel and M. Berberian and published in 1985 by John Wiley & Sons Ltd, Chichester, UK, ISBN 0 471 90634 4.



Women exposed to the fumes of firewood and other fuels have a high incidence of pulmonary heart disease. (Photo by J. Hartley, OXFAM)

Environmental pollution: special factors in developing countries

The pathophysiological effects of exposure to environmental pollutants are not expected to vary from one part of the world to another, but the intensity of the effects may be more pronounced in developing countries because of unhygienic living conditions, malnutrition, etc. . .

When discussing respiratory diseases caused by environmental pollution, one has to take note of the high incidence of pulmonary heart disease (cor pulmonale) in women exposed to the fumes of firewood, dried animal dung, or even kerosene inside their homes in crowded urban settlements. Recent studies have revealed that the smoke generated by these fuels contains almost all of the toxic components found in the smoke emitted when fossil fuels are burnt, but in concentrations far exceeding those established for these substances in the WHO environmental health criteria and national standards.

Dietary factors can influence the toxicity of chemicals in several ways. The toxicities of several pesticides are enhanced in rats given different levels of protein in their diet. The direct effect of protein deficiency on the capacity of the liver to detoxify xenobiotics is well established.

The inherited susceptibility of many people living in tropical Africa to the side-effects of antimalarial of anti-tubercular drugs, haemolytic anaemias, and pancreatitis, and the vulnerability of the tribal people in countries like India to various infections, all demonstrate the influence of genetic factors on the response of the host to xenobiotics.

The toxic potential of environmental pollutants can be affected by the high ambient temperature of many developing countries. In the high temperature and humidity of the working environment, it is uncomfortable to wear protective clothing. This can increase the level of exposure to and absorption of toxic chemicals.

The influence of altitude on the health effects due to exposure to air pollutants is apparent in Mexico City, and in workers engaged in the processing of mineral resources in high altitude areas of Chile, Bolivia, India, and Nepal who are exposed to noxious smoke and fumes in addition to the physiological stress of altitude.

In summary, it would be unrealistic to assume that the threshold limit values (for pollutants) derived for the highly industrialized countries are applicable to workers and the general population in

tropical or semitropical countries who may have a background of undernutrition and parasitic infections and who may be exposed to an unhygienic environment. This may also be true for acceptable daily intakes.

From: WHO Technical Report Series, No. 718, 1985 (*Environmental pollution control in relation to development: report of a WHO Expert Committee*), pp. 14–15.

SI Units in Radiation Protection and Measurements

This is Report No. 82 from the National Council on Radiation Protection and Measurements (NCRP).^{*} It provides an introduction to SI units in general, but more specifically to SI units as applied to the quantitative measurement of radiation and its effects, particularly on biological materials.

Le Système International d'Unités (SI) is now accepted as the established system of units and dimensions for use throughout the world in all fields of science and technology. However, in particular specialized areas of science where the establishment has grown up with and gained familiarity with an older system of units, the change to SI calls for an investment of effort that may still seem disproportionate to the reward. This is particularly true of relatively self-contained fields, of which radiation protection is perhaps an example. The reward for changing to SI lies not only in the more logical and simpler relationships involved, but also in the greater ease of working in interdisciplinary areas of science, and in the greater ease with which workers from one area may understand the research frontiers and the established technology of another area.

The measurement of radiation and its effects is full of old-fashioned units, such as the roentgen (R), the rad, the curie (Ci), and the rem. These are now all to be replaced by SI units: the becquerel, Bq (equal to s^{-1}) for activity (i.e. counting rate); the gray, Gy (equal to $J\ kg^{-1}$) for absorbed dose of radiation; and the sievert, Sv (also equal to $J\ kg^{-1}$) for dose equivalent. This booklet is designed to help those making this change. It outlines the history of the development of the SI, its application to this special field, and relation of the older units to the new SI units. It is a welcome addition to the

^{*}NCRP Report No. 82 is published by the National Council of Radiation Protection and Measurements, 1985, 65 pp, ISBN 0 913392 74 X. NCRP publications are distributed by the NCRP Publications Office. Information on prices and how to order may be obtained from: NCRP Publications, 7910 Woodmont Ave, Suite 1016, Bethesda, MD 20814, USA.

SI literature, designed specifically for those working in the field of radiation protection, concerned with the problems of safeguarding human health.

I. M. Mills
Chairman, Commission I.1

Is this a record?

Efrotomycin is an antibiotic produced by *Streptomyces lactamdurans*. It is a complex antibiotic with three components: efrotomycin A₁, efrotomycin A₂ and efrotomycin B. All have lengthy chemical names. For example, component A₂ is:

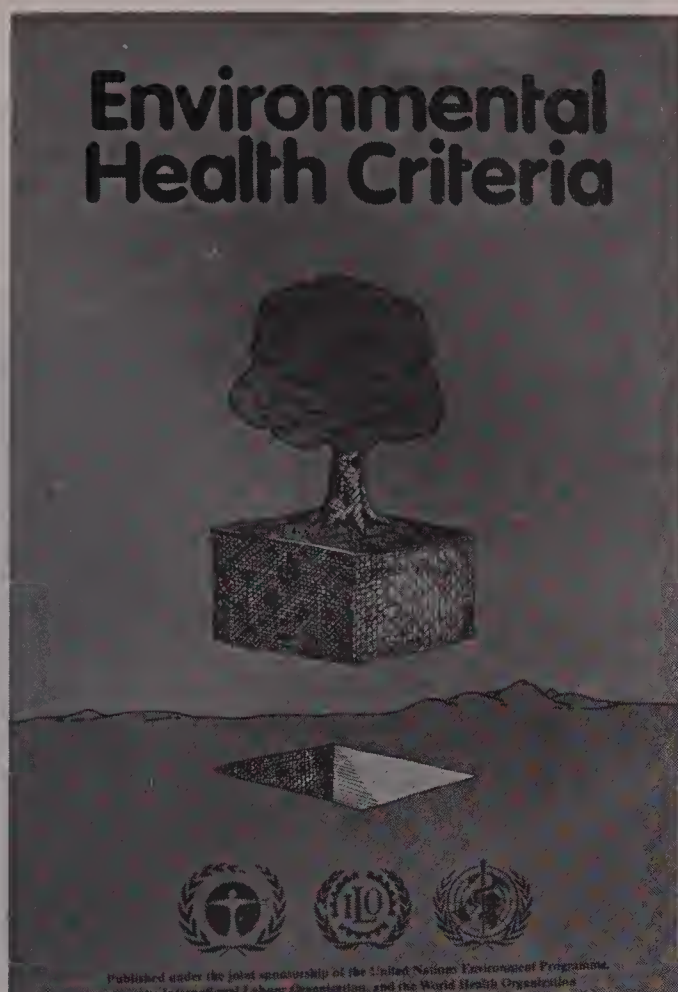
($\alpha S, 2R, 3R, 4R, 6S$)-4-[[6-deoxy-4-*O*-(6-deoxy-2,4-di-*O*-methyl- α -L-mannopyranosyl)-3-*O*-methyl- β -D-allopyranosyl]oxy]-*N*-[2*E*,4*E*,6*S*,7*R*]-7-[(2*S*,3*S*,4*R*,5*R*)-5-[(1*E*,3*E*,5*E*)-7-[(*E*)-1,4-dihydro-1-methyl-2,4-dioxo-3(2*H*)-pyridylidene]-7-hydroxy-6-methyl-1,3,5-heptatrienyl]tetrahydro-3,4-dihydroxy-2-furyl]-6-methoxy-5-methyl-2,4-octadienyl]- α -ethyltetrahydro-2,3-dihydroxy-5,5-dimethyl-6-[(1*E*,3*Z*)-1,3-pentadienyl]-2*H*-pyran-2-acetamide.

Is this a record for the length of a systematic name of a chemical compound?

The above name and many other names of similar complexity appear in *International Nonproprietary Names for Pharmaceutical Substances* which was published as a Supplement to *WHO Chronicle*, 1985, Vol. 39, No. 5.

Environmental Health Criteria

There are now 46 titles in the *Environmental Health Criteria Series*. The series is published under the joint sponsorship of the United Nations Environment Programme (UNEP), the International Labour Organization (ILO) and the World Health Organization (WHO). It provides an authoritative assessment of what is known about the effects of chemical substances and a number of physical factors on human health and on the quality of the environment. It furnishes the scientific information on which national health and other authorities can base suitable control measures where these are needed, and it gives guidelines for setting exposure limits consistent with the protection of human health in the general environment and in the workplace. Where the substances considered occur in nature (as lead and titanium, for instance), the natural exposure is taken into account. Inevitably, however, the stress is on exposure to such substances during and after manufacture and as



wastes and on entirely man-made products (chemicals for industrial use, pesticides and lasers, for example).

Each volume is concerned with a single substance or group of substances, selected from an internationally agreed list of priorities. Drafts are prepared by individual experts or national institutions and are then subjected to extensive revision by one or more international groups of experts in order to ensure that they are as accurate and comprehensive as possible.

The series also comprises a number of volumes describing the principles and methods that are applied in environmental investigation; those published so far cover toxicity testing, the conduct of studies in environmental epidemiology, and exposure monitoring in relation to pregnancy.

The volumes that deal with chemical substances are for the most part the outcome of work performed by the International Programme on Chemical Safety (IPCS); this is a joint venture of UNEP, ILO and WHO. Those that concern sources of non-ionizing radiation are prepared jointly by the International Radiation Protection Association (IRPA) and WHO, with funding from UNEP.

Publications in the Environmental Health Criteria Series deal with the effects on human health and the environment of exposure to individual chemical compounds or groups of compounds (red covers). The series also includes a number of publications dealing with the methodology of data interpretation and risk assessment (yellow covers).

The 46 titles in the series are

1. Mercury
2. Polychlorinated Biphenyls and Terphenyls
3. Lead
4. Oxides of Nitrogen
5. Nitrates, Nitrites and N-Nitroso Compounds
6. Principles and Methods for Evaluating the Toxicity of Chemicals. Part I.
7. Photochemical Oxidants
8. Sulfur Oxides and Suspended Particulate Matter
9. DDT and its Derivatives
10. Carbon Disulfide
11. Mycotoxins
12. Noise
13. Carbon Monoxide
14. Ultraviolet Radiation
15. Tin and Organotin Compounds
16. Radiofrequency and Microwaves
17. Manganese
18. Arsenic
19. Hydrogen Sulfide
20. Selected Petroleum Products
21. Chlorine and Hydrogen Chloride
22. Ultrasound
23. Lasers and Optical Radiation
24. Titanium
25. Selected Radionuclides
26. Styrene
27. Guidelines on Studies in Environmental Epidemiology
28. Acrylonitrile
29. 2,4-Dichlorophenoxyacetic Acid (2,4-D)
30. Principles for Evaluating Health Risks to Progeny Associated with Exposure to Chemicals during Pregnancy
31. Tetrachloroethylene
32. Methylene Chloride
33. Epichlorohydrin
34. Chlordane
35. Extremely Low Frequency (ELF) Fields
36. Fluorine and Fluorides
37. Aquatic (marine and freshwater) Biotoxins
38. Heptachlor
39. Paraquat and Diquat
40. Endosulfan
41. Quintozene
42. Tecnazene
43. Chlordecone
44. Mirex
45. Camphechlor
46. Guidelines for the Study of Genetic Effects in Human Populations

The prices range from Sw.fr.6. - to Sw.fr.28. -. They are available from national WHO sales agents or in case of difficulty from WHO, Distribution and Sales, 1211 Geneva 27, Switzerland.

Conference Calendar

Conference circulars and registration forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in parentheses.

1986

Photochemistry

27 July–1 August. 11th International Symposium on Photochemistry. Lisbon, Portugal. (Prof. Silvia M. B. Costa, Centro de Química Estrutural, Complexo 1, Instituto Superior Técnico, Av. Rovisco Pais, 1096 Lisboa Codex, Portugal.)

Organic Synthesis

10–15 August. 6th International Conference on Organic Synthesis. Moscow, USSR. (6th ICOS Secretariat, N.D. Zelinsky Institute of Organic Chemistry, Academy of Sciences of USSR, Leninsky Prospect 47, SU-117913 Moscow B-334, USSR.)

Pesticide Chemistry

10–15 August. 6th International Pesticide Chemistry Congress. Ottawa, Canada. (Sixth International Congress of Pesticide Chemistry, c/o Chemical Institute of Canada, 151 Slater Street, Suite 906, Ottawa, Ontario, Canada K1P 5H3.)

Carbohydrates

10–16 August. 13th International Carbohydrates Symposium. Cornell University, Ithaca, New York, USA. (XIII International Carbohydrate Symposium, Conference Services, Box 3, Robert Purcell Union, Cornell University, Ithaca, New York 14853, USA.)

Solubility Phenomena

12–15 August. 2nd International Symposium on Solubility Phenomena. Newark, New Jersey, USA. (Dr Mark Salomon, Co-chairman, Second International Symposium on Solubility Phenomena, PO Box 254, Fair Haven, New Jersey 07701, USA.)

Non-aqueous Solutions

17–21 August. 10th International Conference on Non-aqueous Solutions. Leuven, Belgium. (Dr G. Maes, Department of Chemistry, University of Leuven, Celestijnenlaan 200F, B-3030 Heverlee, Belgium.)

Zeolite Chemistry

17–22 August. 7th International Zeolite Conference. Tokyo, Japan. (Prof. Hiro-o Tominaga (7 IZC), Department of Synthetic Chemistry, Faculty of Engineering, The University of Tokyo, Hongo, Bunkyo-ku, Tokyo 113, Japan.)

Natural Products

17–22 August. 15th International Symposium on the Chemistry of Natural Products. The Hague, Netherlands. (Administrative Secretariat, 15th IUPAC International Symposium Natural Products, c/o Netherlands Congress Centre, PO Box 82000, 2508 EA The Hague, The Netherlands.)

Physical Organic Chemistry

24–29 August. 8th IUPAC Conference on Physical Organic Chemistry. Tokyo, Japan. (VIIth ICPOC, The Chemical Society of Japan, 1-5 Kanda-Surugadai, Chiyoda-ku, Tokyo 101, Japan.)

Coordination Chemistry

24–29 August. 24th International Conference on Coordination Chemistry. Athens, Greece. (XXIV International Conference on Coordination Chemistry, c/o Dr E. Vrachnou-Astra, Department of Chemistry, N.R.C. 'Demokritos', PO Box 60228, 153 10 Aghia Paraskevi, Athens, Greece.)



Keio Plaza Hotel, Tokyo, venue of the 7th International Zeolite Conference.

Raman Spectroscopy

31 August–5 September. 10th International Conference on Raman Spectroscopy. Eugene, Oregon, USA. (Secretary, ICORS-X, Organizing Committee, Chemical Physics Institute, University of Oregon, Eugene, OR 97403, USA.)

Phosphorus Chemistry

31 August–6 September. International Symposium on Phosphorus Chemistry. Bonn, FRG. (Prof. R. Appel, Chairman of the X ICPC, Anorg. Chem. Institut, Universität Bonn, Gerhard-Domagk-Str. 1, D-5300 Bonn 1, Federal Republic of Germany.)

Macrocyclic Chemistry

1–4 September. International Symposium on Macrocyclic Chemistry. Florence, Italy. (Prof. Mauro Micheloni (Secretary), Department of Chemistry — University of Florence, Via Maragliano, 75/77, I-50144 Florence, Italy.)

Phosphorus Chemistry

7–12 September. 2nd International Symposium on Phosphorus Chemistry Directed Toward Biology. Spala, near Lodź, Poland. (Prof. W. J. Stec, Department of Bioorganic Chemistry, Centre of Molecular and Macromolecular Studies, Polish Academy of Sciences, PL-90 362 Lodź, Boczna 5, Poland.)

CHEMRAWN V

22–26 September. Current and Future Contributions of Chemistry to Health — The New Frontiers. Heidelberg, FRG. (Gesellschaft Deutscher Chemiker, Abteilung Tagungen, PO Box 90 04 40, D-6000 Frankfurt am Main, Federal Republic of Germany.)

Natural Toxicants; Mutagenicity of Food

15–17 October. Interdisciplinary Conference (EURO FOOD TOX II). Zürich, Switzerland. (Dr R. Battaglia, Kent Laboratory, Postfach, CH-8030 Zürich, Switzerland.)

Environmental Characterization

10–12 November. International Symposium on New Sensors and Methods for Environmental Characterization. Kyoto, Japan. (International Symposium SMEC, c/o Institute for Chemical Research, Kyoto University, Uji, Kyoto 611, Japan.)



'Speaker's Corner', Conference Centre, Villa La Loggia, Florence, venue of International Symposium on Macrocyclic Chemistry.

Reduced conferences fees for Affiliates

Organizers of the following conferences have agreed to a 10 per cent reduction in Conference fees for Affiliates:

- 10th International Conference on Non-Aqueous Solutions (Leuven, Belgium, 17–21 August 1986)
- 7th International Zeolite Conference (Tokyo, Japan, 17–22 August 1986)
- 8th IUPAC Conference on Physical Organic Chemistry (Tokyo, Japan, 24–29 August 1986)
- International Symposium on New Sensors and Methods for Environmental Characterization (SMEC) (Kyoto, Japan, 10–12 November 1986)
- 2nd International Symposium on Quantitative Luminescence Spectroscopy in Biomedical Sciences (Ghent, Belgium, 11–14 May 1987)
- International Symposium on Free-Radical Polymerization: Kinetics and Mechanism (Genoa, Italy, 17–23 May 1987)
- 31st International Symposium on Macromolecules (Merseburg, GDR, 30 June–4 July 1987)
- International Conference on Heteroatom Chemistry (ICHAC-1987) (Kobe, Japan, 19–24 July 1987)
- 8th International Symposium on Solute–Solute–Solvent Interactions (Regensburg, FRG, 9–14 August 1987)

1987

Quantitative Luminescence Spectrometry

11–14 May. 2nd International Symposium on Quantitative Luminescence Spectrometry in Biomedical Sciences. Ghent, Belgium. (Dr Willy R. G. Baeyens, Laboratory of Pharmaceutical Chemistry and Drug Quality Control, Faculty of Pharmaceutical Sciences, State University of Ghent, Harelbekestraat 72, B-9000 Ghent, Belgium.)

CHEMRAWN VI

17–22 May. CHEMRAWN VI. World Conference on Advanced Materials Needed for Innovations — Energy, Transportation and Communications. Tokyo, Japan. (CHEMRAWN VI Coordinating Office, The Chemical Society of Japan, 1-5 Kanda-Surugadai, Chiyoda-ku, Tokyo 101, Japan.)

Free-Radical Polymerization

17–23 May. International Symposium on Free-Radical Polymerization: Kinetics and Mechanisms. Santa Margherita Ligure, Nr. Genoa, Italy. (Prof. Savegrio Russo, C.N.R. Center on Macromolecules, Corso Europa 30, I-16132 Genoa, Italy.)

Macromolecules

30 June–4 July. 31st International Symposium on Macromolecules. Merseburg, GDR. (Technische Hochschule "Carl Schorlemmer", Leuna-Merseburg, Macro 87, Otto-Nuschke-Strasse, DDR-4200 Merseburg, German Democratic Republic.)

Macromolecules

6–9 July. 30th Microsymposium on Macromolecules. Polymer-Supported Organic Reagents and Catalysts. Prague, Czechoslovakia. (Dr P. Čefelín, Scientific Secretary, P.M.M. Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovského náměstí 2, CS-16206 Prague 6-Petriny, Czechoslovakia.)

Bioinorganic Chemistry

6–10 July. 3rd International Conference on Bioinorganic Chemistry. Noordwijkerhout, The Netherlands. (Prof. J. Reedijk, State University Leiden, Gorleaus Laboratories, PO Box 9502, NL-2300 RA Leiden, The Netherlands.)

Macromolecules

13–16 July. 10th Discussion Conference on Macromolecules. Small-angle Scattering and Related Methods. (Dr P. Čefelín, Scientific Secretary, P.M.M. Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovského náměstí 2, CS-16206 Prague 6-Petriny, Czechoslovakia.)

IUPAC Congress

13–18 July. 31st International Congress of Pure and Applied Chemistry. Sofia, Bulgaria. (Secretariat, 31st IUPAC Congress, c/o Dr R. Vlahov, Institute of Organic Chemistry, Bulgarian Academy for Sciences, 1113 Sofia, Bulgaria.)

Heteroatom Chemistry

19–24 July. International Conference on Heteroatom Chemistry (ICHAC-1987). Kobe, Japan. (Prof. Michio Kobayashi, Secretary, ICHAC-1987, c/o Kinki Chemical Society, 1-8-4, Utsubo-Honmachi, Nishiku, Osaka 550, Japan.)

Organometallic Chemistry

26–30 July. Fourth International Symposium on Organometallic Chemistry Directed Towards Organic Synthesis (OMCOS IV). Vancouver, B.C., Canada. (Prof. Michael D. Fryzuk, Department of Chemistry, The University of British Columbia, 2036 Main Hall, Vancouver, British Columbia, Canada V6T 1Y6, Canada.)

Chemical Education

26–31 July. Ninth International Conference on Chemical Education. Sub-title: 'Chemistry for our New World'. São Paulo, Brazil. (Prof. Ernesto Giesbrecht, Instituto de Química, Universidade de São Paulo, Caixa Postal 20.780, 01498-São Paulo, SP, Brazil.)

Coordination Chemistry

26–31 July. 25th International Conference on Coordination Chemistry. Nanjing, China. (Prof. Xiao-Zeng You, Conference Secretary, XXV ICC, Coordination Chemistry Institute, Nanjing University, Nanjing, Jiansu Province, China.)

Solute–Solute–Solvent Interactions

9–14 August. 8th International Conference on Solute–Solute–Solvent Interactions. Regensburg, Federal Republic of Germany. (Prof. J. M. G. Barthel, Institut für Physikalische und Theoretische Chemie, Universität Regensburg, Universitätstrasse 31, D-8400 Regensburg, Federal Republic of Germany.)

Trace Elements

17–21 August. 2nd Nordic Symposium on Trace Elements in Human Health and Disease. Odense, Denmark. (Prof. Philippe Grandjean, Department of Environmental Medicine, Institute of Community Health, Odense University, J. B. Winslows Vej 19, DK-5000 Odense C, Denmark.)

Fourier Transform Spectroscopy

24–28 August. 6th International Conference on Fourier Transform Spectroscopy. Vienna, Austria. (6th FTS Conference 1987, c/o Interconvention, PO Box 80, A-1107 Vienna, Austria.)

Plasma Chemistry

31 August–4 September. 8th International Symposium on Plasma Chemistry. Tokyo, Japan. (Prof. Kazuo Akashi, Dept. of Metallurgy & Materials Science, Faculty of Engineering, The University of Tokyo, 7-3-1, Hongo, Bunkyo-ku, Tokyo 113, Japan.)

CHEMRAWN IV

21–25 September. "Modern Chemistry and Chemical Technology Applied to the Ocean and its Resources". Woods Hole, Massachusetts, USA. (Dr Derek W. Spencer, Associate Director for Research, Woods Hole Oceanographic Institution, Woods Hole, MA 02543, USA).

1988

Natural Products

29 May–4 June. 16th International Symposium on the Chemistry of Natural Products. Kyoto, Japan. (Prof. Sho Itô, Department of Chemistry, Faculty of Science, Tohoku University, Aramaki-aza-Aoba, Sendai 980, Japan.)

Macromolecules

1–6 August. 32nd International Symposium on Macromolecules. Kyoto, Japan. (Prof. Takeo Saegusa, Department of Synthetic Chemistry, Faculty of Engineering, Kyoto University, Yoshida-machi, Sakyo-ku, Kyoto, 606 Japan.)

Physical Chemistry of Colloids and Macromolecules

Edited by **Bengt Rånby**

Royal Institute of Technology, Stockholm, Sweden

Proceedings of the *International Symposium on Physical Chemistry of Colloids and Macromolecules* to celebrate the 100th birthday of **Professor The (odor) Svedberg**, pioneer of colloid and macromolecular research, Uppsala University, Sweden 1984.

The Symposium Volume contains the main addresses and invited lectures describing the intense and successful work of a great scientist in a wide area. Retrospective lectures follow Svedberg's shift in interest from inorganic colloids to proteins and other macromolecules and, finally, to nuclear and radiation research.

The main lectures invited describe current research in the 'Svedberg areas'. They reflect the importance of Svedberg's pioneering research on colloids and macromolecules. The development of ultracentrifugal sedimentation, and other preparative and analytical methods for protein which followed, has made Uppsala a leading research center in the field of protein analysis.

Svedberg's broad interests in research covered a wide field in physics, chemistry, biology and technology-and a life-long devotion to botany as described by Professor Sven Brohult in his general lecture on 'Svedberg as a Scientist'.

The Symposium was attended by 220 scientists, of whom 100 were from abroad, representing 17 countries.

Outline of Contents:

Introductory lectures; Retrospective lectures on Svedberg's contributions; Colloid and surface science; Sedimentation analysis of macromolecules; Macromolecular solutions and gels; The Svedberg-a man of many interests and talents; The Svedberg's views on science, technology and society.

July 1986. 200 pages, illustrated. About £20.00 ISBN 0632 01536 5

Published for the
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Prepared for the **IUPAC** Commission on Oils, Fats and Derivatives, this definitive reference book contains more than eighty standardized methods for the analysis of oils, fats and their derivatives, which have been adopted by the Commission. Topics covered include the preparation of the samples for analysis, the determination of chemical and physical characteristics and the determination of quality and stability and the book is intended to be used as a reference by chemists and specialists in industry, trade and international organizations.

Outline of Contents:

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Handbook of Thermodynamic and Transport Properties of Alkali Metals

CHEMICAL DATA SERIES NO. 30

Edited by Dr Roland W. Ohse, Commission of the European Communities, Joint Research Centre, Karlsruhe Establishment, Karlsruhe, Federal Republic of Germany

The purpose of this *Handbook* is to summarize and assess the vast amount of available data and to provide both the practicing engineer and basic research worker with current knowledge on structural, thermodynamic and transport properties of alkali metals. In order to guarantee a comprehensive and up-to-date survey of the field, an international team of ca. eighty leading scientists from throughout the world was invited to assess their own specialization as it applies to alkali metals.

The first two sections of the *Handbook* cover the basic relationships and theory of liquid metals, including the latest developments in model approaches and computer simulation, and provide the necessary background and present status. Section 3 on technological applications summarizes the various applications of alkali metals in modern technologies. Section 4 gives a complete survey of the existing techniques of high-purity preparation and its analytical aspects. A special chapter is devoted to safe handling. The structural, thermodynamic and transport properties and their methods of evaluation are critically assessed in sections 5 to 7. Solutions of non-metals in alkali metals are treated in section 8, and in section 9 the binary and ternary alloy systems and their properties are summarized.

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The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary, non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.

Its objectives are:

- to promote continuing co-operation among the chemists of the member countries;
- to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
- to co-operate with other international organizations which deal with topics of a chemical nature;
- to contribute to the advancement of pure and applied chemistry in all its aspects.

The membership of IUPAC presently comprises 42 countries, each represented by a national organization, such as an academy of science or research council.

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Chemistry International



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The news magazine of the International Union
of Pure and Applied Chemistry (IUPAC)



Emerging
Technologies
of the
1990s



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Front cover: Several chemical companies are diversifying into microelectronics.

Strong medicine for IUPAC?

On a recent visit to our home, my father-in-law was deeply engrossed in a book called *Strong Medicine**. This is the latest novel by the popular author Arthur Hailey. Suddenly, he looked up at me and said "Your organization is mentioned in this book". My father-in-law is not a chemist and so I smiled politely in disbelief. "Really?", I replied. Later, when he had left the room, I picked up the book and surreptitiously thumbed through the pages. Sure enough, there on page 381 I read:

The Geneva system for chemicals had been devised by the International Union of Pure and Applied Chemistry, abbreviated to IUPAC and pronounced 'U-pak'. The idea was that the name of any chemical compound should also indicate its structure. Thus, *iso*-octane became 2,2,4-trimethylpentane, acetic acid — common vinegar — was ethanoic acid, and ordinary glycerin, propan-1,2,3-triol. Unfortunately, chemists who were supposed to use the IUPAC names seldom did, though examiners required them. Thus Yvonne was learning the new names for the exams, the old for future lab work.

She asked, 'Don't you use IUPAC names in the lab?'

'Not often. Most of us can't remember them; also they're unwieldy. Anyway, let me test you on both.'

'Go ahead.'

Successively, Martin called off twenty chemicals, sometimes using the old name, with others the newer code. Each time without hesitating, Yvonne recited the alternate.

Martin closed the book, shaking his head. 'That memory of yours still amazes me. I wish I had one like it.'

Notice the sentence "Unfortunately, chemists who were supposed to use the IUPAC names seldom did . . .". Fact or fiction? A mixture of both, I suspect. The sentence does, however, provide an answer to a question I raised in a previous editorial. Can or does IUPAC make any impact on the general public's view of chemistry, chemists and "chemicals"? (see *CI*, No. 1, p. 1, 1986). The answer to my question is obviously "yes" as far as Arthur Hailey is concerned. It would seem that the popular view is that chemists — but not examiners — find IUPAC nomenclature largely irrelevant.

This is certainly the impression I used to get when I attended non-IUPAC meetings of chemists. "What is IUPAC?" some of them would ask. Others, more knowledgeable, equated IUPAC with nomenclature and then proceeded to denounce IUPAC recommendations. Few chemists outside the old 'charmed circle' were aware that IUPAC is also highly active in chemical education, sponsors some 30 international conferences each year, publishes widely and has close links with chemical industry and other international organizations.

Hopefully, with the successful launch of the Affiliate Membership Scheme earlier this year, IUPAC will find much wider acceptance amongst chemists. From the correspondence the Secretariat is receiving from Affiliates, the signs are that there is an increasing eagerness to find out more about the Union and participate in its activities.

**Strong Medicine* by Arthur Hailey is published by Michael Joseph Ltd, London 1984, ISBN 0 7181 2469 3. We are grateful to Michael Joseph Ltd and Souvenir Press Ltd for permission to reproduce the above extract from the book.

Have you registered yet?

All Affiliates are reminded to complete their blue Affiliate Membership Registration Forms and return them to the Affiliate Affairs Secretary as soon as possible. Only Affiliates who have returned these forms will be included on the recruitment lists which are scheduled to be sent to Commission Chairmen in December 1986 (see *CI*, Vol. 8, No. 4, p. 9). If you have not yet received a blue form you should first check with your National Adhering Organization (NAO)/National Chemical Society (NCS) that your name and address has been submitted to the IUPAC Secretariat. If your name and address has been submitted then please inform the Affiliate Affairs Secretary if you have not received a blue form.

lupacitis

This is a disease which afflicts chemists who have been exposed to high levels of chemical nomenclature over long periods. A common symptom is the tendency to use chemical terms incorrectly in everyday language as in the following example: "Why can't anyone these days do anything properly?" The editor of *CI* would be interested to hear of other cases of lupacitis.

Agog in The Hague

'How many Affiliates do you have so far?' asked Prof. Reedijk.

'Well over 5000 now', replied the Affiliate Affairs Secretary modestly.

'Over 5000?' queried Prof. Reedijk agog. 'If you had said over 500, I would have thought you were doing quite well'.

This conversation took place at a meeting held in The Hague earlier this year. The meeting, organized by the Netherlands Convention Bureau, was attended by chemistry editors from several countries and prominent Dutch chemists — including Prof. Brinkman, President of the Royal Dutch Chemical Society (KNCV).

At the meeting Ir. van der Gracht, Executive Secretary of KNCV informed the Affiliate Affairs Secretary that the Royal Dutch Chemical Society would commence operating the Affiliate Membership Scheme in The Netherlands in 1987.

Agog, by the way, is a funny English word (derived from the French *en gogue*) meaning eager, expectant, amazed or surprised. In Prof. Reedijk's case, it meant that his mouth dropped right open!

Letter to The Editor

Flagging economy?

Sir,

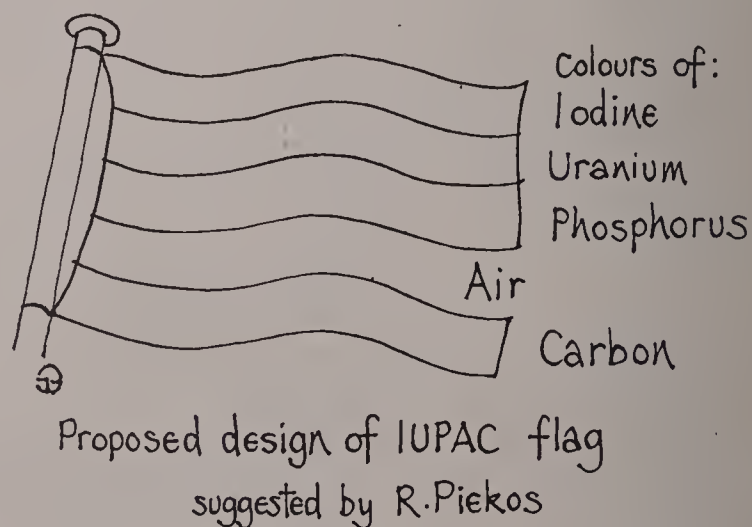
I seriously think that IUPAC should have a flag. We have got a badge and even a necktie. The flag thus seems an urgent necessity. We would assemble in its shadow during hot weather, thus reducing expenses for beverages.

By the way, at least three *iso*-flags are conceivable depending on the colour of the phosphorus allotrope (see cartoon).

Yours IUPACously,

Prof. Ryszard Piekos,
Commission V.8,
Faculty of Pharmacy,
al. K. Marksa 107,
PL-80-416 Gdansk,
Poland.

PS. Now I am considering how to reduce your address.*



*The following address was used by Prof. Piekos!

Dr Michael Freemantle
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Rossiter leaves Kodak

Dr Bryant W. Rossiter, Chairman of the CHEMRAWN Committee (see *CI*, No. 4, p. 6–7, 1986) left Eastman Kodak Company on 30 June 1986 to become the President of Viratek, Inc. and a Vice-President in its parent organization, ICN Pharmaceuticals, Inc., located in Costa Mesa, California, USA. Viratek, Inc. is a drug-development organization specializing in antiviral and other drugs. Dr Rossiter's new address is Viratek, Inc., 3300 Hyland Avenue, Costa Mesa, California 92626, USA. Tel: +1 (714) 540 1866.

We regret to record the death of:

Prof. W. C. Fernelius, USA (30 June 1986) — Inorganic Chemistry Division Committee (1973–77), Commission on Nomenclature of Inorganic Chemistry (1955–79), Interdivisional Committee on Nomenclature and Symbols (1971–79).

Mr A. T. Møller, Denmark (16 December 1985) — Commission on Oils, Fats, and Derivatives (1969–85).

Affiliates in The Philippines

Of the 5400 Affiliates who registered in the first six months of 1986, 300 were from developing countries. These included 200 sponsored by means of grants from UNESCO and ICSU. A total of 14 developing countries are now operating the Affiliate Membership Scheme. One of these is The Philippines where 10 chemists have been sponsored as IUPAC Affiliates.

The person responsible for operating the scheme in The Philippines is Prof. Lydia C. Crisostomo who is Secretary of the Integrated Chemists of the Philippines and the Chemical Society of the Philippines. She is also Past President of the Philippine Association of Food Technology (PAFT). At present Prof. Crisostomo is Plant Research Chief of the Laboratory Services Division of the Bureau of Plant Industry of the Ministry of Agriculture and Food.

The ten Affiliates include Dr Emerenciana Ballelos Duran who is presently the Senior Science Research Specialist and Officer-in-Charge of the Health Physics Research Division of the Philippine Atomic Energy Commission. Her activities include research on en-



Prof. Lydia C. Crisostomo,
Affiliate
Membership
Secretary in the
Philippines.

vironmental radioactivity measurements in the Philippines. Another Affiliate is Miss Maria Lourdes M. De Mata who is research chemist of the Bureau of Plant Industry. She trained with the Tropical Development and Research Institute in London, UK in 1982 on post-harvest fruit, vegetable and rootcrop technology. At present, she undertakes researches on post-harvest

Miss Maria Lourdes M. de Mata.



Dr Emerenciana Ballelos Duran.



Dr Alberto D. Rivera.



Wet room of the Laboratory Services Division of the Bureau of Plant Industry.

changes in tropical fruits and vegetables. Philippines Affiliate Dr Alberto D. Rivera is the Technical Assistant to the Director of Corporate Research and Development of San Miguel Corporation. He was formerly with Proctor and Gamble International working on surfactants. He trained under Dr William F. Bailey of the University of Connecticut on physical organic chemistry particularly on stereochemical and conformational analysis of molecules. Dr Fabian M. Dayrit is with the Department of Chemistry of Ateneo de Manila University. His research interests include organometallic chemistry particularly on homogenous catalysis of organic reactions using organometallic compounds and biologically active natural products.

The Integrated Chemists of the Philippines

The Integrated Chemists of the Philippines (ICP) was organized to integrate all professional chemistry organizations in the Philippines into one solid body to unify their ideals and objectives. It was registered on 14 July 1976 at the Securities and Exchange Commission. All registered chemists in the Philippines, including those who may later qualify as registered chemists by

Instrument room of the Laboratory Services Division of the Bureau of Plant Industry.



examination or by operation of law are qualified to become members. ICP and the other chemistry organizations publish the *Philippine Chemical News* quarterly.

The President of ICP and the Chemical Society of the Philippines is Dr Rogelio P. De Leon, Director of Chemistry of the United Laboratories, Inc. He obtained his Bachelor of Science degree from the University of the Philippines and his Doctor of Philosophy at McGill University, Montreal, Canada.

Dr Rogelio P. de Leon, President of ICP and the Chemical Society of the Philippines.



Who's who in IUPAC

In this, the fifth of our series on who's who in IUPAC, we publish a pen-portrait of Dr Stanley S. Brown who succeeded Prof. F. W. Sunderman Jr as President of the Clinical Chemistry Division in September 1985.

Dr Stanley Brown was born in London in 1933 and educated at schools in the south of England as far apart as Sussex and Cornwall. His interest in chemistry was fostered by an excellent school teacher of the old-fashioned kind. This man's right thumb was always swollen and stained on account of using it as stopper in shaking large test tubes; he was also famous for flying into a rage when boys

dropped carbide pellets wrapped in blotting paper into the ink wells. Practical chemistry curricula nowadays are much more limiting!

Dr Brown took up a State Scholarship at the University of London and graduated in chemistry in 1954 at a college (Queen Mary) where molecular orbital theory and classical organic chemistry both flourished, side-by-side. The work for his PhD



Dr Stanley S.
Brown.

thesis reflected a happy medium between these extremes, and it was memorable for a succession of minor fires (Grignard reactions), explosions (phosphorus tribromide residues), and gassings (chlorine, nitrogen oxides). These events stimulated a real interest in laboratory safety and human toxicology, which has been maintained right up to the present time. The PhD studies also generated an interest in biosynthetic pathways, which at the time was a relatively new and very exciting topic, at the interface of chemistry and biochemistry. It was natural to go on to do postdoctoral work in medicinal chemistry, as applied to cancer, at the Chester Beatty Research Institute in London and the Marie Curie Memorial Foundation in Caterham. Cancer chemotherapy was burgeoning and research funds seemed to be freely available. It was very rewarding to be a member of teams which made important and lasting contributions to our understanding of the biological actions of the alkylating agents and antimetabolites. Quite apart from learning to use many new separation and characterisation techniques, it was also highly instructive to interact with the world of drug patents, drug trials, and drug companies. Most of the chemical and biochemical input, however, was directed to hamsters, mice, rats and rabbits, so that it was time to move on to chemical toxicology in a clinical context.

In 1965, Dr Brown joined the University Department of Clinical Chemistry, Edinburgh, as lecturer (and later senior lecturer) with special responsibility for liaison with the Poisoning Treatment Centre of Edinburgh Royal Infirmary. The Centre was the oldest of its kind in Britain, but it had not previously had specialized laboratory support for investigating the aetiology and management of clinical poisoning. Drug overdosage was — and still is — a major cause for emergency admission to hospital,

but there was little rational basis for the treatment of severe poisoning, even with common drugs such as barbiturates, salicylate and paracetamol. Substantial advances were made in these and other areas of clinical toxicology by collaborating with enthusiastic physicians and applying to the problems a judicious mixture of clinical chemistry and chemical toxicology.

The early years of the 1970s saw the emergence in Britain of a new governmental approach to science ("Rothschild"), which was designed to encourage research-with-practical-applications. So it was that Dr Brown joined the staff of the Medical Research Council in 1972, to head a Clinical Chemistry Research and Development Subdivision at the Clinical Research Centre, Harrow. The emphasis here was on developing novel instrumentation and techniques in needful areas of clinical chemistry, for application to a wide variety of clinical problems. Good accuracy, as well as precision, was crucial to the success of these projects, and this led to fundamental and fruitful work on definitive and reference methods of analysis of biological materials, especially for the trace metals. Several of the analytical systems which were developed at the Clinical Research Centre have been made the basis of successful commercial products. In 1983, Dr Brown moved back into the kind of clinical work with which he was involved in Edinburgh, as Director of the West Midlands Regional Laboratory for Toxicology, based in Birmingham. This involves service and research commitments in the areas of analytical toxicology, therapeutic drug monitoring, and trace metal analysis. Rather specialized micro-techniques are used, and a centralized approach to the work is practicable and cost-effective because there are good communications throughout the catchment population (5.5×10^6), which is the largest of the Health Regions in England.

Dr Brown has been actively involved with several national and international academic and professional bodies, including the Biochemical Society, the Association of Clinical Biochemists, the Royal College of Pathologists, and the International Federation of Clinical Chemistry. He is a member of the Editorial Boards of three journals, and he has published many papers, originally in organic and medicinal chemistry and latterly in the fields of analytical biochemistry, toxicology and clinical chemistry. He has edited or co-edited seven monographs and books on these topics, some of them IUPAC publications. He first became involved with IUPAC in 1973, as a Titular Member of the newly formed Commission on Toxicology (Clinical Chemistry Section, later Division), and he was in turn, Secretary and Chairman. He was Vice-President of IUPAC Clinical Chemistry Division from 1981 to 1985.

Why *Clinical* Chemistry? — a Personal View

Prof. Dieter Vonderschmitt

What is so particular about clinical chemistry that it is not just part of analytical chemistry? Why do we need a Clinical Chemistry Division in its own right within IUPAC? Why does the Division have its own Commission on Teaching? Why is automation so important that it needs a separate commission? These are some of the questions discussed by Prof. Vonderschmitt in this article which sets out to explain the aims and activities of clinical chemists.

Introduction

Clinical chemistry is quite properly a part of the all-embracing field of pure and applied chemistry, and its origins are firmly rooted in 18th century organic chemistry. Nowadays, clinical chemistry is located at the far edge of the scale from pure to applied chemistry. In fact, the world of medicine, (medical schools, hospitals and medical services generally) tends to consider clinical chemistry as part of medicine or, more correctly, as part of clinical pathology. According to the definition by a distinguished Swiss Clinical Chemist¹, clinical chemistry "is that branch of medicine which is concerned with developing and carrying out chemical analyses of body fluids and other biological material for the diagnosis, therapy and prophylaxis of diseases." Moreover, the College of American Pathologists² states that "Analytical goals can only be defined in terms of the needs for patient care. Any other basis is irrelevant." Although these statements are correct, we must recognize that the methods used in clinical chemistry are based on sound analytical principles. This article tries to outline the position of clinical chemistry within the framework of pure and applied chemistry and to answer some questions that are often asked by chemists.

A service to the medical community

A chemical test on a patient's specimen such as blood, serum, faeces or urine is performed to screen for the presence or absence of disease, to diagnose a disease, to monitor response to therapy and/or to predict an outcome. The tests must meet three objectives: they must be *reliable*, *fast* and *economic*. Obviously the fastest test is not necessarily the most reliable, the most reliable is not always the most economic and the most economic is hardly ever the most rapid. The problems of the clinical laboratory service are those of optimization and compromise with respect to these criteria.

The necessity to produce reliable results is evident. Reliable, however, means different things. It means that results must be accurate, precise, specific and sensitive. It also requires a level of laboratory organization that ensures absolute identification of patient samples, and engenders confidence in the interpretation of results in terms of their clinical implications. An unreliable result is worse than no result at all, as the consequence may mean patient mismanagement or even a fatal outcome. Emergency clinical intervention requires a fast return of analytical data. Some parameters such as oxygen partial pressure in blood, blood pH, plasma potassium and blood glucose concentra-

The author

Dieter J. Vonderschmitt was born in 1938 and educated at schools and in the University of his home town, Basle. He received his doctoral degree with a thesis in inorganic chemistry in 1964. In 1973, he was appointed Director of the Central Laboratory of Clinical Chemistry, at the University Hospital of Basle. Seven years later, he became Professor of Clinical Chemistry at the University of Zurich. Prof. Vonderschmitt is a member of the Committee of the Swiss Society of Clinical Chemistry, and served as President from 1981 to 1984. He has been a member of the Committee of IUPAC Clinical Chemistry Division since 1981. His research interests are in analytical applications of immobilized enzymes, two-dimensional electrophoresis of proteins, and the statistical basis of data reduction and the interpretation of clinical tests. (He also enjoys drawing cartoons as a hobby — see p. 000!)





A blood specimen being taken through an indwelling venous catheter from a volunteer subject (guess who?) in a trial of drug absorption.

tions change so rapidly under certain clinical conditions that results which are not available within an hour of sample collection are of little use in the treatment and management of the patient. The clinical chemistry

"... the fastest test is not necessarily the most reliable, the most reliable is not always the most economic and the most economic is hardly ever the most rapid."

laboratory is therefore under constant pressure to produce accurate and precise analytical results rapidly. In addition, the magnitude and impact of the work load is dependent on patients diagnostic and therapeutic needs, which are largely out of the control of the laboratory. In recent years law suits against medical malpractice have increased and have resulted in a new (albeit undesirable) emphasis on chemical testing. These problems present particular challenges in laboratory management.

The cost of chemical testing has also become an increasingly important factor. In many countries the cost of medical care is a major concern of national health authorities. The economic factor is therefore of considerable weight in the optimization process. The pressure to rationalize and economize has led to extensive automation of the more frequently requested tests. Indeed, clinical chemistry pioneered automated analysis, which is nowadays widely used in the chemical and pharmaceutical industries.

The methods of clinical chemistry

In classical analytical chemistry, mixtures of components are usually first separated into single constituents and these are determined quantitatively. As separation methods are inherently time consuming, clinical chemists have always aimed at specific determinations of single components within the complex biological matrix. There is, therefore, a need for highly specific reactions. Since direct chemical methods often do not achieve this specificity, many have been replaced by enzymatic, immunochemical or physical methods.

Enzymatic and immunologic methods are frequently coupled to chemical reactions resulting in coloured or

fluorescent products which can be measured quantitatively by simple photometers. Physical methods which frequently have the advantage of not requiring the addition of reagents include atomic emission spectroscopy (AES), cryoscopy, the use of ion sensitive electrodes (ISE), and gas sensitive electrodes (GSE). These methods are particularly suitable for the quantitative measurement of some gases and simple ions. Although many chemical methods have become obsolete, some components are still determined by such methods. These include calcium, phosphate, creatinine, total protein (but not specific proteins), bilirubin, and iron. Enzymatic methods are used to measure simple substrates including glucose, urea, urate, triglyceride, and cholesterol.

Specific proteins and components of smaller relative molecular mass which are present in very low concentrations, are frequently quantified by immunologic reactions, radioimmunoassay (RIA) being the most common. This is steadily being supplanted by other techniques such as enzyme immunoassay (EIA), fluorescence immunoassay (FIA) and fluorescence polarization immunoassay. There is a rapid evolution of new techniques and new tests in this field, although automated processors are only just being developed. Replacing chemical methods by more specific enzymatic and immunologic techniques has increased the reliability, but also the cost.

Education and training of clinical chemists

As a truly multidisciplinary subject, clinical chemistry is not only based on a sound education in chemistry — particularly analytical chemistry — but depends heavily on an up-to-date knowledge of biochemistry and medicine. The clinical chemist must be able to develop new methods for the diagnosis, therapeutic monitoring and prevention of disease, and must also be able to advise on the choice and interpretation of such tests. A test that is analytically reliable is not necessarily diagnostically useful, as it may produce false positive or negative results with respect to a particular disease. The clinical chemist must be aware of, and be able to advise on, this problem.

Clinical chemists may have trained originally as



Atomic absorption spectrophotometry for the analysis of trace metals, such as lead and cadmium, in blood. An electrothermal instrument with automatic sampler is in the foreground, and a manual flame instrument in the background.

Draft documents on clinical chemistry education and training

The International Federation of Clinical Chemistry (IFCC) Education Committee and IUPAC Commission of Teaching of Clinical Chemistry (VII.3) have prepared two draft documents on clinical chemistry education and training:

- 'A Basic Education and Training Framework for Medical Laboratory Technicians in Clinical Chemistry', published in *J. Clin. Chem. Clin. Biochem.* Vol. 22, pp. 497-501, 1984 and *Clin. Chem. Newsletter* No. 5, pp. 97-101, 1985.
- 'Guidelines (1985) for Teaching of Clinical Chemistry to Medical Students', published in *J. Clin. Chem. Clin. Biochem.* Vol. 23, pp. 697-703, 1985 and *Clin. Chem. Newsletter* No. 5, pp. 120-126, 1985.

Announcements will be made in *CI* when the final versions of these recommendations are published.

biologists, pharmacists, biochemists or physicians but the individual's background is unimportant in the sense that this does not affect the goals of the profession. It does however mean that chemistry graduates must acquire some medical knowledge and conversely that medical graduates need to enhance their chemical and analytical training.

Many countries require Licensure³ to be granted to practising clinical chemists. In some this means that the profession is almost completely in the hands of physicians (e.g. Germany); in others, pharmacists (e.g. France); and in still others, chemists and biochemists (e.g. Switzerland). The clinical chemist must be able to communicate with his "customers", the physicians. Consequently some medical training is mandatory, and it is for this reason that educational programmes differ from those of the rest of the chemical community.

As every physician makes use of the results of chemical testing, an educational programme for medical students is necessary⁴ with emphases on the interpretation of results, and on sampling and sampling errors. A physician must be aware of the sources of errors, the limitations of methods and tests, and the significance of his actions on the tests. He must know the factors which interfere with the results of tests, for example, the *in vivo* and *in vitro* influences of therapeutic drugs. Clinical chemists are also engaged in the continuous education of clinicians and other hospital staff. Up-to-date information about new tests and methods, interferences, interpretative aspects and clinical significance is most important since the field of laboratory medicine and clinical pathology is rapidly developing.

Associated disciplines

Diagnosis often relies on clinical investigations together with imaging procedures and laboratory tests. Imaging by nuclear magnetic resonance tomography, positron

emission tomography and endoscopic techniques have made considerable progress in recent years and they now form part of the diagnostic process. Moreover, in addition to chemical tests, there are a number of other laboratory tests performed on patient samples in related disciplines such as hematology, immunology, serology, histology and microbiology. These are often associated in a unified clinical pathology department. Small laboratories, or laboratories in small hospitals, may perform the whole range of important tests in chemistry, hematology, serology and microbiology. There is, therefore, a need to train people to work in these multi-discipline laboratories.

Many results of chemical tests are important for the hematologist and *vice versa*. Chemists therefore need to have a good understanding of what their colleagues in clinical pathology are doing. Often these laboratories share a common data management system. The boundaries between disciplines in clinical pathology are ill defined. Thus immunology and clinical chemistry overlap in the determination of specific proteins by antigen-antibody reactions and electrophoretic methods; either or both may be carried out in either department. Automation in the clinical chemistry laboratory may take over tests that were originally developed in the immunology laboratory. Clinical toxicology and endocrinology are other fields which may be encompassed in the clinical chemistry laboratory. Likewise, the determination of serum concentrations of therapeutic drugs may be done in a clinical chemistry or clinical pharmacology department or in a unit for infectious diseases. In all cases, close cooperation is important.

Automation

There is increasing pressure on physicians and surgeons to reduce the time of the bed occupancy of their patients. This increases the demand on laboratory services as doctors seek to back-up their clinical decisions with a greater number of tests and a faster response. The only way in which these increased demands can be satisfied is through automation. Automation is not only the most economic solution — it also increases speed and reliability. The earliest automatic (or rather mechanical) devices were dedicated to only one test. Mechanization of several tests



An automated reaction rate analyser for measuring enzyme activities in blood serum specimens.

meant the use of several dedicated instruments, or successive batches of samples for different tests being run on the same apparatus. It was soon realized that the clinical chemistry workload consists of a few tests requested frequently and a much larger number requested only occasionally. Approximately 20 tests account for about 90% of the workload while the remaining 10% covers 200 different tests. Analysers which processed samples for 20 different tests were designed as a consequence. These instruments not only performed the analysis of specimens but also eliminated the tedious and error-prone distribution of specimens to the various work stations where the different tests were previously carried out.

Initially, automated equipment was limited to photometric detection. Methods had to be developed or modified to fit the specifications of analysers in terms of time, sample and reagent volumes, for example. This development was followed by the use of detectors based on flame photometry, fluorimetry, turbidimetry and more recently on ion selective electrodes. Progress in electronics and integrated circuits has also had its impact on automation. While some analysers measure up to 20 parameters on every sample, the current generation determines only those parameters requested by the physician for each particular sample (random access analysers). In addition, microtechniques have made it possible to reduce sample size and reagent consumption to the microlitre range. Automation has had other significant impacts. Some analysers encompass a complete system of hardware, reagents and software; this may result in an efficient, but inflexible system over which the operator has little or no control. Other analysers require pre-packaged and pre-determined reagents which are also out of the control of the operator. This has important staffing implications in those countries where high levels of technical expertise and competence have been developed within the laboratory, but now run the risk of being under used with the attendant frustrations that this will produce.

These problems, and the variety of different principles of design that are now incorporated into automatic equipment have created the need to carry out evaluations on new major analysers. Protocols for evaluation are now agreed nationally in many countries, and there are currently moves to produce international agreements. This in turn, has encouraged the use of systematic nomenclature for terms used to describe the performance of analytical equipment and processes.

Automation is now being introduced into other laboratories such as hematology laboratories, where flow cytometers are able to recognize different blood cells labelled by fluorescing or coloured antibodies. Differential counting based on cytochemical reactions affords high precision because of the large number of particles that can be observed in a relatively short time. Immunology, serology and microbiology are also at the threshold of automation; it is quite conceivable that in future the automated areas of laboratory medicine will merge into one sub-unit of the clinical laboratory.

One important step in the chemical analysis of blood

is the separation of the red blood cells from the serum or plasma. This involves centrifugation, which is time consuming (~ 10 minutes) and is carried out manually. Analysers that could process whole blood would substantially contribute to a faster response. It is likely that automatic devices will be constructed in the near future to deal with this problem.

In the last few years, reflectance photometers have been developed which enable doctors to analyse blood samples quickly in their offices using a simple paper or plastic test strip. This "solid phase chemistry" is based on test strips which contain reagents in solid form that interact with the blood to form a coloured product, the concentration of which is determined by diffuse reflectance. More sophisticated strips are being developed that will accommodate whole blood and yet allow the concentration of plasma constituents to be measured.

The role of industry

Manufacturers of instruments and diagnostic reagents have played an important role in clinical chemistry. The development of large-scale automation has only been possible as a result of considerable investment by the companies in this field. Versatility and ingenuity in the design and operation of automated equipment are impressive. The evolution of analytic instruments in clinical chemistry during the last twenty years has demonstrated enormous progress in terms of reliability, speed and the reduction of sample and reagent volumes. However, today's instruments are often outdated by technical advances before they reach the market place, and strong competition between manufacturers has raised the standards of performance. Modern analysers not only control their analytical process by microprocessors, but also have quality assessment and data handling programs. They are able to present the formatted data to an interface, although much remains to be done to standardize the data transfer.

The manufacturers of diagnostic reagents have also provided an invaluable service to clinical chemistry laboratories in the production of diverse and high quality reagents. Fifteen years ago, it was possible for a large laboratory to manufacture its own reagents, but today no single laboratory has the facilities to produce the wide range of reagents required. No longer is it possible to produce reagents of consistently high purity and specificity, to isolate and purify enzymes and antibodies to produce monoclonal antibodies and to couple tracers (fluorophores, radioisotopes, enzymes) to antigens and/or antibodies. Industrial companies have the knowledge and resources to rapidly implement new scientific findings, and to use them in the creation of new and useful tests. There is no doubt that the diagnostic industry has strongly influenced the methodology of clinical chemistry.

In recent years there has been a merging of instrumental and diagnostic reagent interests. Instrument manufacturers have started to produce their own reagents and to develop systems designed to operate with them. Similarly, manufacturers of diagnostic

reagents have started to develop their own instruments. Some companies now produce a comprehensive range of laboratory support services from reagents to analysers and laboratory computer systems, including both software and hardware. These innovations and developments have resulted in the considerable number of new instruments and methods that are now available to clinical chemists.

Research in clinical chemistry

The multi-disciplinary character of clinical chemistry is also reflected in the research activities of clinical chemists. Interactions with fundamental sciences such as biochemistry and pathophysiology have virtually led to a new science: pathobiochemistry. Success in tracing clinical symptoms back to the cause of a disease by analysis of metabolites and elucidation of metabolic pathways is most evident in the inborn errors of metabolism. In many other domains, pathobiochemistry is only able to project macroscopic phenomena — the symptoms of disease — to the level of the microscopic; molecular phenomena cannot yet be adduced to offer an explanation of the causes of disease. Nevertheless, clinical chemists have contributed substantially to our present understanding of lipid metabolism, diseases of connective tissue, and the actions of different hormones, to give just a few examples.

According to the aims of clinical chemistry and in parallel with the evolution of fundamental knowledge in pathobiochemistry, the first task of research is to develop new and useful diagnostic tests. The task has several components: the transformation of a new concept into a practical means of measuring quantities of constituents in body fluids; establishing the accuracy and precision of the determination, and the reference values; and estimation of the clinical significance in terms of diagnostic specificity and sensitivity.

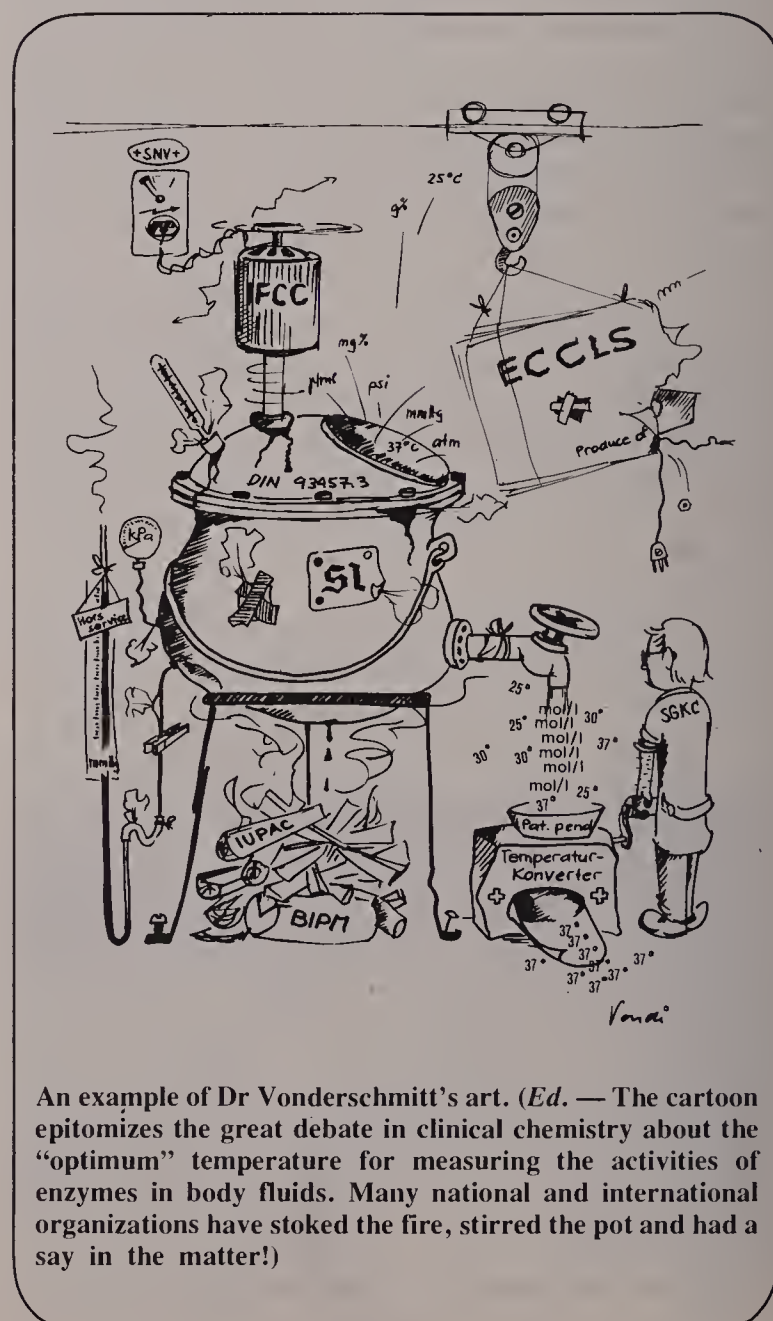
New analytical techniques applied to the problems of clinical chemistry open up exciting areas for laboratory investigations. With the development of two-dimensional protein electrophoresis, for example, patterns can be obtained presenting close to a thousand different and distinct protein spots. Given the right tools, analysis of the patterns could yield useful clinical information. Analysis of intracellular proteins is another promising field of clinical chemistry. Substances present in very low concentrations like hormones, endorphines, encephalines, interleukines, etc., as well as trace metals, present different challenges, and knowledge is rapidly expanding; this is where the clinical chemist works at the limit of highest sensitivity. Moreover, in the near future, DNA probes are likely to play an important role, and find applications in new clinical chemical tests.

Through daily interactions with clinical colleagues the clinical chemist is likely to be involved in clinical research and able to offer help in correlating clinical findings with values of chemical parameters. The scope of this research ranges from chemical screening of

defined populations in preventative medicine, to the clinical evaluation of tests proposed in the literature.

The IUPAC Clinical Chemistry Division

The character of clinical chemistry requires that the Clinical Chemistry Division maintain close contact with other Divisions and with organizations like the international Federation of Clinical Chemistry (IFCC) and the World Health Organization (WHO). The four commissions of the Division, therefore, have worked together with other commissions in IUPAC and with the corresponding bodies of IFCC. Projects conducted under the auspices of IUPAC tend to be more fundamental in nature, while those sponsored by IFCC emphasize the more practical aspects of clinical chemistry. One topic, however, is especially important both to IUPAC and IFCC. In clinical chemistry, it is essential that clinical chemists and physicians worldwide speak the same language. The introduction of SI units into the discipline in the 1970s therefore presented a great opportunity. However, doctors are rather conservative in their approach to laboratory reports so that SI units are only now beginning to be accepted worldwide by clinicians. The Clinical



Chemistry Division and its Commission on Quantities and Units have made tremendous efforts to promote the use of "substance concentration" in reporting results of chemical analyses to doctors. Many arguments were gathered together and presented, with the aim of convincing the medical community of the usefulness of the mole concept. The Division's Commission on Teaching has also been involved in promulgating SI units, besides working on other important tasks.

The Commission on Automation was renamed the Commission on Automation and Clinical Chemical Techniques in 1981 to reflect more accurately the scope of its work. The extensive use of mechanized and automatic devices, and the rapid evolution of new analytical techniques, has called for the standardization of words and terms, procedures, interfaces, calibration systems and so on. There is a great diversity of work to be tackled in these areas. Finally, the newest of the Division's commissions, that on toxicology, has been very successful in tackling problems of analytical harmonization in the specialized area of some trace metals which are of occupational and environmental importance.

In summary, the practical work of the clinical chemist, and many of the underlying problems, are of a chemical and technical nature. Close contact with pure and applied chemistry and a presence in IUPAC are essential. Clinical chemists identify with IUPAC's efforts to promote international standardization and codification in the different branches of chemistry. A good many clinical chemists are already involved with the important work of the Union. They can do a great deal to enhance the public image of chemistry, especially in terms of their contact and involvement with the medical community.

Conclusion

Clinical chemistry is both a discipline in its own right and an interdisciplinary activity. However, it is firmly based on analytical technology, and it makes use of a

wide range of chemical and biochemical methods, including microtechniques, mechanization, automation, and data processing. Clinical chemistry offers a service to the medical community that requires effective communication between clinical chemists and doctors; this is only possible if both parties have an adequate knowledge of chemistry, biochemistry, physiology and medicine. The evolution of biochemistry into pathobiochemistry has generated a demand for new tests by the medical profession which is a constant challenge to clinical chemists worldwide. The International Union of Pure and Applied Chemistry plays, and should continue to play, a major role in efforts at standardization and codification through the Clinical Chemistry Division.

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CHEMRAWN III

CHEMRAWN III, entitled "World Conference on Resource Material Conversion — (Bio-)Chemical Process Bridges to meet Future Needs" was held in The Netherlands in June 1984. The following items are taken from the *Conference Perspectives and Recommendations** which was published last year.

Introduction

From its formation immediately after World War I up to the early 1970s, IUPAC dealt primarily with international scientific administrative matters, such as publications, abstracts, and international agreements on nomenclature, atomic weights, methods, and the like. It also sponsored international meetings during which experts in the subdisciplines of chemistry pre-

sented results of chemical research.

In the early 1970s, however, several leaders in IUPAC governing bodies proposed that IUPAC move beyond its traditional activities and address international problems on which chemistry has a direct bearing. They saw that IUPAC's international contacts put it in a unique position to tap the expertise of the world's best chemists. They also saw, however, that no science functions in a vacuum and that the interplay

with political, economic, and cultural forces must be assessed as well. Perhaps most important, they further saw that simply examining a problem is not sufficient but that a continuing effort also is essential to disseminate findings and promote adoption of solutions by persons in policy positions in government agencies, industrial companies, and research and educational institutions.

As a result of their efforts, IUPAC in 1975 embarked on what has become known as the CHEMRAWN program or, according to the formal operating designation, *CHEMical Research Applied to World Needs*. CHEMRAWN I was held in Toronto, Canada, in July 1978. It dealt with future sources of organic raw materials, then a topic of major concern in the light of oil embargoes, rapidly rising prices for petroleum, and depleting petroleum reserves.

CHEMRAWN II was held in Manila, Philippines, in December 1982. It dealt with world food supplies, a topic of heightened concern in light of the continuing rapid increase in world population.

CHEMRAWN III, World Conference on Resource Material Conversion — (Bio-)Chemical Process Bridges to Meet Future Needs was held in The Hague, The Netherlands, 25–29 June 1984, and was an update of CHEMRAWN I. As the title suggests, CHEMRAWN III was less concerned with developing alternatives to petroleum than it was with developing more cost-effective and efficient methods for conversion of organic raw materials into feedstocks, intermediates, and high-technology chemicals. This does not imply that the oil crisis of the 1970s has disappeared; rather, it has been postponed for a decade or two. This should suggest to future planners, particularly in government and academia, that the world has before it an opportunity to develop alternative feedstocks, particularly from coal, under non-crisis conditions.

In the meantime, world competitive conditions require a much closer look at those chemical process-engineering and related bridges that will link the demands of the present with the needs of the future. That is the essence of what CHEMRAWN III is about.

Bryant W. Rossiter
Chairman, CHEMRAWN Committee

Chemrawn III, revisiting Chemrawn I

Chemrawn I (Toronto, 1978) addressed the questions of future availabilities of raw materials and of substitutability.

The foreseen changes in the world mix of raw material were then seen as imminent and a decision was taken to review progress in the action programme proposed by Chemrawn I, in 1984. Specially, the substitution of petrochemical feedstock by coal needed close monitoring, because our knowledge basis of coal as a feedstock needed an urgent update, while we saw it eroding.

Chemrawn III was designed to present the review of our raw material position, as recommended in 1978.

However, today availability and even price are no longer perceived as agonizing problems. We have become confident that we can cope with the supplies the market will offer. But, substitutability will remain an issue, perhaps even more so than ever before, for developing as well as for developed countries.

When it comes to substitution, time lags in research and development, depreciation and investment strategies can be considerable. Entrance fees for new processing techniques are normally high, where they have to compete against existing plants and as a rule investment decisions in research and development become only sufficiently brave where the winning alternative is more clearly visible.

Therefore, Chemrawn III got a slightly different emphasis from what was agreed to in Toronto. Availability was reviewed indeed, but full attention was given to the issue of balance between adaptability and adaptation of our future chemical plants, to meet the demands of changing markets.

Full adaptation meets the requirement of being the lowest cost producer, as long as things stay as they are. Design for degrees of adaptability trades off the costs of the adaptability for the capability to cope efficiently with change. The subtitle of Chemrawn III “(bio-)chemical process bridges to meet future demands” has to be read in this sense.

The present volume of the Proceedings of Chemrawn III comprises its recommendations, a summary of its findings and synopses of the six plenary lectures.

The summary of its findings is designed such that technologists, industrialists, administrators, politicians and educationalists can easily find the paragraphs of their interest.

The synopses of the plenary lectures give expert views on the developments in chemical processing, the world needs as perceived today and the resource situation. Each of these three main topics has been dealt with by two specialists of different background.

The opening by Prince Claus of the Netherlands, who addressed the symposium on a closely related subject dear to his heart, that is the mondial responsibilities for industrial development based on knowledge, completes the Proceedings.

The organisers hope that the recommendations together with an account of the plenary lectures and a summary of the session findings will contribute to a consensus on the course of action to be taken by the chemical communities of the world.

W. J. Beek
Chairman, CHEMRAWN III

**Conference Perspectives and Recommendations* from CHEMRAWN III: World Conference on Resource Material Conversion — (Bio-)Chemical Process Bridges to meet Future Needs (The Hague, Netherlands; 25–29 June 1984) is available from the CHEMRAWN III Congress Bureau, QLT Convention Services, Keizersgracht 792, 1017 EC Amsterdam, Netherlands at a cost of 60 Dutch Guilders. Working papers can be bought from QLT for 160 Guilders, and the working papers and the Perspectives volume together can be obtained at a discounted price of 200 Guilders.

Recommendations of Chemrawn III

I Technology

1. C₁-Technology, based on methanol made from remote natural gas or coal looks promising and should be developed further.
2. In the long term base chemicals production via complete gasification of coal to produce base chemicals will become important. Research and development to bring this about under non-crisis conditions is encouraged.
3. Research to improve catalysts and separation processes should be given first priority, since this offers the greatest opportunity for economic improvement, and the development of other technologies is critically dependent on them.
4. The biomass is not seen as an important source of chemical feedstock at the present time except in isolated situations. Breakthroughs in the conversion of cellulosic waste material to base chemicals could change this situation dramatically.
5. The most important techniques to stimulate the further development of biotechnology-based industries are:
 - genetic engineering (DNA-insertion and -deletion)
 - protoplast fusion
 - culture of plant and animal cells
 - enzyme technology
 - waste water purification.
6. Institutional cooperation to maintain pure and stable cultures of microorganisms and to provide banks of DNA-vectors should be encouraged.
7. Further development and application of computer-aided technologies for process improvement and control is strongly indicated.

II Resources/Industrial Development

1. Productivity and efficiency should be emphasized instead of increased capacity. This calls for restructuring, retrofitting and energy conservation of existing plants.
2. Development of the chemistry necessary to convert non-petroleum feedstock into energy sources should be regarded as a long-term programme. In the short-term, energy conservation measures should be enhanced and petroleum recovery techniques improved.
3. The separation and upgrading of waste are major bottlenecks in recycling technology. These problems should be tackled in a coordinated way by industry, governments and scientific institutes.
4. Further development of new materials should be seen as a prerequisite for end product availability in the future.

III Industrial/Science Policies of Governments

1. Structural adjustments and an international redistribution of production on a free market basis

are indicated with a view to eliminating government-subsidized inefficiencies.

2. Governments should strive to make raw materials available to industry at world market prices and favour a policy of diversity of supplies in order to increase options and flexibility.
3. International harmonization of legislation and regulations for laboratory and production safety, product characterization and patent law uniformity will remain an important goal.
4. Governments should stimulate development of integrated programmes for improving infrastructure and networks, especially in:
 - information and telecommunication
 - automation and computer-integrated manufacturing
 - biotechnology R&D (See also recommendation I.6)

IV Education

1. Education should promote mental flexibility, creativity and entrepreneurship along with basic mathematical, communicative and scientific and engineering skills.
2. Interdisciplinary training is more important than narrow specialization in view of the multidisciplinary approach of Chemical R&D.
3. The education of chemists should continue to provide an understanding of first principles. Therefore, basic research should remain a major educational objective for universities.

V Developing Countries

1. Transfer of technology from industrial to developing countries should take into consideration local patterns of culture and consequent norms and values.
2. Educational strategies supporting technology transfer should contain the following elements:
 - priority be given to local education and vocational training.
 - university education and research be directed towards the local needs, and the grants system be applied accordingly.
 - exchange of experience also be stimulated by and among the developing countries themselves.

Evens to odds

Chemistry International will be published in odd months next year. The first 1987 issue will be published in January and subsequent issues in March, May, July, September and November. The change has been made so that biographies of those nominated for election as Officers or Bureau Members can be published in the July issue prior to the Boston General Assembly in August.

As the pace of innovation accelerates, the chemical and allied industries are having to make increasing efforts to capitalize on new scientific ideas for their survival. In this article, Shigeyoshi Takaoka, Executive Director of SRI-International Asia Regional Headquarters in Japan, takes a look at the emerging technologies in the 1990s and considers the role of chemists and chemical engineers in these new technologies.

Introduction

Chemical industry, which employs the bulk of chemists and chemical engineers, is facing an uncertain future in the developed countries mainly due to the structural changes of the industry. It is anticipated that the annual growth rate in the 1990s will be slower than in the 1960s and 1970s as the industry matures further. According to an SRI study the growth rate of ethylene, a main petrochemical industry bellwether, is expected to be less than 4% per year over the next few years (see Table 1). In Japan, in particular, the growth of the chemical industry is lower than that of GNP.

Emerging technologies

For this reason, the chemical and the allied industries are making major efforts to capitalize on new scientific ideas for their survival. These efforts have been stimulated by global competition, worldwide demand for new products, and growing constraints on the supply of energy and materials. Emphasis is therefore on products that permit new levels of performance or provide new capabilities.

Recently the pace of innovation and thus the rate of introduction of new technologies have both been accelerating. In the 1990s and beyond, several new technologies are likely to emerge and the industries based on these new technologies are expected to grow at a much faster rate than GNP and the chemical industry. They are also expected to be the driving force of world economic growth in the next generations. It is expected in Japan that industries based on advanced technologies will take up 15 to 20% of the GNP by the middle or the 1990s with basic industries taking up 15 to 20% and other industries 60 to 70%. In comparison, the share of GNP of the advanced technological industries was only 2% in 1980.

Table 1. Outlook of GNP and ethylene demand. (Annual growth rate from 1984 to 1992).

	(1) GNP	(2) Ethylene	(2)/(1)
United States	2.7	3.2	1.19
Western Europe	2.2	2.4	1.09
Japan	3.0	2.8	0.93



**Shigeyoshi
Takaoka.**

Table 2. Important technologies expected to emerge in the 1990s.

- Microelectronics, computers and communications
- New materials
- Biotechnologies

Among the technologies expected to emerge in the 1990s and beyond, the three shown in Table 2 seem to be the most important. R&D programmes of some major Japanese chemical companies are shown in Table 3.

Microelectronics, computers and communications

In the past decade, we have witnessed spectacular advances in information technology. Few people in 1970 anticipated the extent to which computers would now surround us and influence our daily lives.

The information technologies have not only had one of the largest impacts of any new technology in the past two decades. They will continue to do so for several more decades because they are more rapidly creating new opportunities and new products.

At the heart of this development is a tiny device about which we have all heard a great deal — the microelectronic circuit. Already, the marginal cost of adding substantial information processing capability to the manufactured products is small. By 1990, almost anything that costs more than US-\$20 and plugs into a wall or a battery will contain a microprocessor.

Because of microelectronic circuiting, an important change in perspective is occurring that will determine the thrust of technology in the 1990s. In the broadest

Table 3. R&D programmes for major Japanese chemical companies in advanced technology fields.

Company	Electronics	Materials	Biotechnologies
Mitsubishi Chemical	gallium arsenide photoresist	carbon fibre rare metals ion exchange membrane	plant seed tissue plasminogen activator (TPA) human monoclonal antibody (MAb) beta-endolphene by E-coli
Sumitomo Chemical	photoresist high purity gallium	carbon fibre aluminium fibre hydrophilic polymer reverse osmosis	interferon human growth factor (HGF) T-cell growth factor
Mitsui Toatsu Chemical	printed circuit board	magnetic powder	plant seed amino acids TPA MAb
Showa Denko	gallium phosphide gallium arsenide hybrid IC substrate laminated board	carbon fibre silicon carbide hydrophilic polymer alloys for hydrogen storage	amino acids
Ube Industries	electroceramics polyimide film for PCB	silicon nitrides metal fibre reinforced nylon	
Asahi Chemical	photoresist LSI optical disk microfiche	carbon fibre membranes silicon nitride	amino acids interferon TNF
Toray Industries	photoresist multilayer board	carbon fibre fine ceramics membrane functional polymers	interferon L-lysine T-cell growth factor

sense, this change can be viewed as a shift in emphasis away from optimizing the efficiency of systems and towards optimizing the efficiency of people.

In the fields of microelectronics, computers and communications, the specific areas that chemists and chemical engineers should contribute are shown in Table 4.

Technologies related to materials, devices and fabrication are destined to play increasingly vital roles for microelectronics, computers and communications.

The electronics world is currently dominated by silicon and silicon devices, and silicon will be the dominant electronics material for many years. However, an increasing number of binary, tertiary, and quaternary III-V semiconducting compounds are competing with silicon for high-frequency microwave applications. These III-V compounds are also used as light emitting diodes. Gallium arsenide is probably the most widely used and most widely studied material of the numerous compound semiconductors. Chemists and chemical engineers can greatly contribute to the development of new semiconductors both in producing high purity single crystals of large size and at low costs and in fabricating these into devices in full cooperation with electronic engineer and physicist.

In 1981, the Ministry of International Trade and Industry of Japan (MITI) selected three areas as the most important basic technologies to be developed for

the next generation. They are new materials, biotechnologies and new functional devices. In the new functional devices, three topics have been selected. They are super lattice devices, three-dimensional circuit devices and anti-environment devices.

This is the software age already and it has been hastened by the advent of microcomputers. In many cases, software is the principal value added to an instrument or device that uses a large- or small-scale computer. Microcomputers and decentralized comput-



Technologies related to materials, devices and fabrication are destined to play increasingly vital roles for microelectronics, computers and communications.

Table 4. Specific areas that chemists/chemical engineers can contribute in microelectronics, computers and communications.

-
- Materials
 - Devices
 - Software
 - Expert systems
 - AI robotics
 - Information storage
-

ing have spawned a surge of computer applications for which hardware costs are small, but software costs are large. This trend is expected to be accelerated in the 1990s and beyond.

An expert system starts with an expert, a computer scientist called a knowledge engineer, and a sophisticated interactive computer system. The knowledge engineer, in cooperation with the expert, codifies the judgements of the expert into a specialized problem-solving system. This system, in turn, can make judgements similar to those of the expert. Additionally, it continues to learn from experience. It can actually assist a user in reaching a conclusion or solving a problem. Expert systems can be developed for catalysts, chemical synthesis, medical diagnosis, complex business problem solving and geological prospecting.

Another promising technology, computer-based automation technology, will soon be able to provide the means to change over mode of industrial production radically and beneficially. The most exciting new application of robotics will come with advances in artificial vision and machine sensing of touch, force and torque. Major batch-production industries will constitute the greatest market for this technology, and will be the most affected by it. In chemical industries, robots have been considered to have somewhat limited applications because so much of chemical processing is automated already. However, it can be used in cleaning reactor vessels or heat-exchangers, in maintenance shops for routine equipment refurbishing, in packaging products, and in sample preparation in laboratory quality control functions.

Another technology that will have great impact is fibre optics. This has great potential in computer applications as well as in the transmission of information. Photons travel at the speed of light, in contrast to electrons, which travel several orders of magnitude more slowly. Thus the use of photons could make tomorrow's supercomputers many times faster than the fastest computers that we have today.

Another use of photon technology is information storage. If you look on the back of your credit card, you will see a dark strip about 7 mm wide extending across the width of the card. This magnetic strip can now contain 1720 bits or 212 characters of information about the card holder.

Using the technology developed at SRI, Drexler Corporation is commercializing an optical recording system that would store 5 million bits of information on

the small strip. This means that, literally, the entire history of an individual's financial transactions could be stored on a bank card. Or several filing cabinets of information could be reduced onto a small optical card. This represents a breakthrough of many orders of magnitudes in information storage and retrieval.

Another exciting research area is organic electronics. In effect, it may be possible to grow the equivalent of electronic semiconductors in protein substrates. These organic "chips" would be many times smaller than today's silicon or gallium arsenide semiconductors.

New materials

Progress and enhancement in high technology industries depend heavily on achievements in material science. New materials are already making an impact in the transportation industries, communication industries, and construction industries. The target of new material development is to improve its present characteristics or to add new functions. The important areas of new material development are shown in Table 5.

These four areas have also been selected by MITI to be developed as basic technologies for industries of the next generation.

The increasing costs of energy have also prompted R&D in high-temperature materials. These programmes have been based on the concept that higher operating temperatures will provide more efficient energy conversion systems. One of the more prominent programmes has been the design of gas turbines containing ceramic components. Silicon carbide and silicon nitride have emerged as materials with the best properties even though these ceramic materials are brittle and cause considerable problems in the design of high-temperature gas turbines. The properties of these ceramics vary depending on the method of fabrication or processing, microstructure, the type and amount of additives, and the thermal history. The estimated fuel savings for an automotive gas turbine are approximately 25%. Thus, there is a large incentive to proceed with the development of high-temperature structural ceramics.

In the functional polymers, shown in Table 6, development of high-efficiency separation membranes, conductive polymers, high crystalline high modulus polymers, and bioerodible polymers, seems to be important and promising. The first three polymers are the targets of R&D programmes to be developed in the next 10 years by MITI.

Membrane technology promises to produce some remarkable breakthroughs within the next decade. Synthetic membranes are already replacing a whole range of industrial separation processes, from distil-

Table 5. Important areas of new materials.

-
- Fine structural ceramics
 - Functional polymers
 - Composite materials
 - Amorphous alloys
-



Reverse osmosis module for producing ultra-pure water used in the semi-conductor industry.

lation to filtration. They are increasingly being used to filter out pollutants, to purify and concentrate substances, to recover rare minerals, and to produce pure antibiotics. One of the most important applications may be the desalination of seawater and manufacturing of ultra-pure water for industry by reverse osmosis. I believe synthetic membranes will soon be used to make a wide variety of new products, from drugs to beverages and from fuels to food.

Conductive polymers could be called synthetic metals. They are either metal (such as silver or nickel) or carbon black dispersed in the polymer and may be used for heating materials, resistors, antistatic materials, high-voltage cable coating material, screening material for high-frequency waves and electrode materials. Polymers such as polyvinylcarbazole can be used as electronic photo-sensitive material. Polyacetylene and polyphenylene are electron conductive and can be used for electronic devices. Polymers such as methacrylates can be employed as optical fibre instead of glass fibre.

High strength, high modulus fibres were developed in the mid-1960s using rigid chain polymers that exhibited a high degree of crystallinity. These polymers are rodlike polyamides and a typical example is DuPont's Kevlar. Recently SRI has developed poly-(benzobisthiazole) (PBT) the chemical structure of which is shown in Figure 1. PBT has higher tensile strength and modulus than Kevlar 49. It should be noted that any polymers developed so far have not utilized the bonding strength between molecules to the full extent. For example, in Kevlar 49 the actual tensile strength is only 13% of the theoretical value and its modulus is 63% of theoretical value. Therefore, as research on polymers progresses, it is possible that polymers with higher tensile strength and modulus than

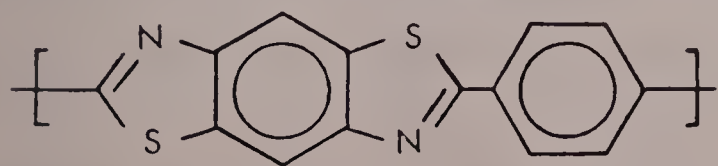


Fig. 1 Poly-(benzobisthiazole)

Table 6. Important functional polymers.

- Membranes
- Conductive polymers
- High crystalline polymers
- Bioerodible polymers

Kevlar and PBT may be produced from common polymers such as polyethylene.

Recent and important research is also being done on bioerodible polymers. Research on these materials has been driven by the need for drug delivery systems that can deliver drugs continuously over long periods of time and at rates that can be calculated very accurately.

Composite polymers, such as carbon fibre reinforced plastics (CFRP) are stronger than steel and lighter than aluminium. These properties will lead to the introduction of CFRP components in automobiles and aircraft in order to reduce fuel consumption. Body weight can be reduced and the structure can be made stronger. Already Boeing is introducing major quantities of these polymers in its new 767 widebody aeroplanes. Use of these polymers in the automobile industry in the future will include such products as radial tyre belts, reinforcement for brake linings and gaskets, and body panels. Other composite materials are polymers (thermo-setting or thermoplastic), metals (such as aluminium) or ceramics (such as silicon carbide), reinforced with carbon fibre, and other organic or inorganic fibres.

Another important class of materials for the 1990s is amorphous alloys. Scientific research has shown that metallic glasses or amorphous alloys can be produced by cooling molten metal so fast that it does not have time to form its customary crystalline structure. They exhibit remarkable properties such as high ductility, easy magnetization and mechanical toughness. Therefore, the flexible ribbons made from, for example, iron-based amorphous alloys with boron are the material of the future for electrical power transmission transformers, motors, generators, and switches.

Biotechnologies

It is popular to say that the 1990s will belong to biotechnology. In some areas, that may be true, but many, perhaps most biotechnology applications will come in the 21st century.

Eventually, biotechnology's contributions will be truly revolutionary in their impact. The human ability to understand and harness nature's basic life processes through technologies such as gene splicing could alter the course of industrial evolution.

Genetic engineering, and fermentation are two important components of biotechnology. Genetic engineering includes recombinant DNA, cell cultivation and cell fusion.

The driving forces that spur interest in biotechnology includes potential process improvements that will reduce energy requirements, increase product yields, and enable research to use inexpensive raw materials as energy sources.

The most promising current applications of bio-



Japanese scientists working on the development of interferon using cell culture.

technology are, as shown in Table 7, in the pharmaceutical areas. Longer term prospects lie in industrial chemicals, agriculture, and eventually in metallurgy and electronics — for example, bacteriological extraction of metals and organic memories for computers. Biotechnology will provide improvements in food-processing applications and enhancements in energy such as conversion of cellulose waste to fuel and in oil recovery.

In the industrial chemicals area, researchers are looking not so much for new products as for more economical processes for existing products. For example, genetic engineering can produce different bacteria for fermentation that use different feedstocks or are more energy efficient. The most likely industrial chemicals produced by biotechnology are shown in Table 8. The most economic disadvantage of industrial chemicals production is the high cost of separating products from very dilute solution of water by distillation as the latent heat of water is very high, although the reaction can be carried out at normal pressure and temperature. Therefore, the successful development of special membranes that can separate the products from water seems to be essential.

Plant engineering through biotechnology offers quite exciting possibilities. There will be little doubt that researchers will eventually engineer more resistant, more water-efficient, and more energy-efficient plants. Also plants that can fix their own nitrogen from air will be developed eventually, thus decreasing or eliminating the need for fertilizers.

MITI has selected industrial bioreactors, large volume cell cultivation and application of recombinant DNA as important technologies to be developed in the biotechnology field for the next generation.

Table 7. Applications of biotechnologies.

● Pharmaceuticals ● Industrial chemicals ● Agriculture ● Metallurgy ● Energy ● Food processing ● Electronics (biochips)

Table 8. Industrial chemicals to be produced biologically by the year 2000.

Acetaldehyde	Formaldehyde
Acetic acid	Geraniol
Acetoin	Glycerol
Acetone	Isubutylenc
Acetylene	Isoprene
Acrylic acid	Isopropanol
Adipic acid	Itaconic acid
Aniline	Linalool
Aspirin	Linalyl acetate
Benzoic acid	Methane
Butadiene	Methanol
Butanol	Methyl ethyl ketone
Butyl acetate	Methyl acrylate
Butyraldehyde	Nerol
Cinnamaldehyde	para-Acetaminophenol
Citronellal	Pentaerythritol
Citronellol	Phenol
Cresols	Phthalic anhydride
Dihydroxyacetone	Propionic acid
Diisodecyl phthalate	Propylene
Dioctyl phthalate	Propylene glycol
Ethanol	Propylene oxide
Ethanolamine	Sorbic acid
Ethyl acetate	Sorbitol
Ethyl acrylate	Styrene
Ethylene	alpha-Terpineol
Ethylene glycol	alpha-Terpinyl acetate
Ethylene oxide	Vinyl acetate

Other technologies

In addition to these exciting emerging technologies, other technologies such as energy, health, space commercialization and ocean development will be emerging in the 1990s and beyond. Also the combination of these advance technologies will generate new products and new industries. For example, micro-processor technology, applied to bioengineering technology, will make it possible to manufacture instruments that are far more accurate in diagnosing disease conditions. Also by combination of membrane to separate out freshwater from salt water with biotechnology, crops and plants that grow on land might be grown on the oceans.

The Science and Technology Agency of MITI conducted a survey called "Technology Development Forecast Up to 2010 in Japan" during the period from 1980 to 1982. The survey was a means of accumulating data preparatory to establishing the nation's basic policies concerning the long-range development of science and technology. Heavy respondents forecast the time of realization of these items. Table 9 shows some of the survey results in chronological order.

Education for chemists and chemical engineers

Chemistry is at the heart of almost all disciplines of science and technology and over the years, chemical research has perhaps returned more to world welfare

Table 9. Time of realization of future technologies.

1990	Development of large-area amorphous silicon solar cell. Wide industrial application of ceramics.
1992	Use of robots in poor working environments involving toxic gases, radioactivity, etc.
1993	Use of membranes for condensation and separation in food, pharmaceutical and chemical industries. Commercial uranium enrichment plant based on centrifugal separation process. Supercomputer using super high-speed devices. Solar cell material featuring thermoelectric conversion efficiency of over 20%.
1994	Technologies for safe disposal of low-level radioactive wastes. Improvement of food production technologies by application of genetic engineering. Super LSI of over 10^8 – 10^9 devices per chip.
1995	Three-dimensional memory devices of over ten layers. Physical and engineering laboratory in space.
1997	Systems for collecting and refining seabed manganese nodules. Large-scale commercial nuclear fuel reprocessing plant.
1998	Breeding of valuable animals and plants by mesoplant fusion. Direct aluminium refining technology.
1999	Development of chemical agents effective for treating clotted cancer growth such as stomach or lung cancer.
2001	Development of chemical drugs for treating arteriosclerosis (hardening of arteries).
2003	Commercialization of steel plant utilizing the heat from nuclear fusion.
2004	Development of technology for converting cancerous cells into normal cells.
2005	Development of superconducting materials having critical temperatures higher than the boiling point of liquefied nitrogen (77K).

than any other single discipline. For chemists and chemical engineers to continue to be effective in the research and development of the new technologies, curricula at college and graduate levels has to emphasize not only the more theoretical side such as solid state chemistry, molecular physics and chemistry, physical chemistry, biochemistry and physics, but also the business side as well to enable graduates to manage these emerging technologies in the uncertain and complex business circumstances in the 1990s and

beyond. It should be noted that about 75% of college graduates hold a management position ten years after graduation. Therefore management education seems to be vital in colleges.
This article is adapted from a paper entitled 'Emerging Technologies in the 1990s and the Role of Chemists and Chemical Engineers'. The paper was presented by Mr Shigeyoshi Takaoka as a plenary lecture at CHEMRAWN III (see pp. 11–13). Photographs courtesy SRI-Asia.

IUPAC 1985

Each year the Executive Secretary of IUPAC prepares a report on IUPAC activities for the International Council of Scientific Unions (ICSU). The following is the 1985 report by Dr M. Williams presented to the 21st ICSU General Assembly held in Berne, Switzerland, 14–19 September 1986.

The main event for IUPAC in 1985 was its 33rd General Assembly, which was held in Lyon, France at the end of August. Delegates from 36 of the 45 National Adhering Organizations were in attendance. An account of the deliberations is given in *Chemistry International* (Supplement 1986 and Nos 5 and 6, 1985; No. 1, 1986).
IUPAC Officers for the period 1985–87 are:

President	— Prof. C. N. R. Rao (India)
Vice-President	— Prof. V. A. Koptug (USSR)

Secretary	
General	— Prof. T. S. West (UK)
Treasurer	— Prof. A. Björkman (Denmark)

There were no applications for full membership of the Union, and Colombia ceased to be a member because of arrears in its annual subscription. The Association of Faculties of African Universities — Chemistry Committee was admitted to Associated Organization status, and all 29 existing Associated Organizations were allowed to continue such

status for the next four years, except for the Association of Editors of European Chemistry Journals which has ceased to exist. In addition to the Observer Countries previously mentioned in 1983, there are now: Chemical Society of Ethiopia, Kuwait Chemical Society, Chemical Society of Malawi, Chemical Society of Pakistan, Papua New Guinea Institute of Chemistry, Integrated Chemists of the Philippines, and Sri Lanka Institute of Chemistry.

At Lyon various statutory changes were approved, covering the Leuven (1981)/Lyngby (1983) national subscriptions structure and discontinuation of the traditional "membership categories" (a new basis for assignment of votes was accepted), and limiting the total period of service for an individual on various IUPAC bodies.

An innovation in budgetary provision for the next biennium requires the seven scientific Divisions to apply for monies available for continuation of current (A) programmes and separately for new priority (B) projects. It was also possible to ease the restriction of the past four years in Titular Membership of Commissions.

The second statutory, biennial critical assessment of IUPAC projects and programmes concluded that a Commission devoted to Teaching in Clinical Chemistry was not more warranted than for many other Divisions and its dissolution is advocated for 1987. Following suspension of their predecessors in 1981, the newly established Commissions on Radiochemistry and Nuclear Techniques, on Atmospheric Chemistry, and on Water Chemistry all met at Lyon. Regarding Medicinal Chemistry, a Provisional Section Committee was created and instructed to report back to the Bureau no later than mid-1987, in particular with respect to specific and detailed project programmes. A standing Committee on Chemical Databases was also created to produce and disseminate in a coordinated manner appropriate databases from existing IUPAC critical data compilation projects. Following consultations with IUPAB and IUB now that the existing programme of work had been completed, the IUB-IUPAB-IUPAC Commission on Biothermo-



Dr Williams prepares his report.

dynamics was dissolved. However, a Working Party was established, with liaison to the biological unions and other bodies outside IUPAC, to make a thorough investigation of emerging needs in biophysical chemistry. At an interdivisional meeting in Lyon, there was general enthusiasm for a restructured Commission on Biotechnology and its proposed principal tasks within the Applied Chemistry Division of the Union. In addition, IUPAC is ready to take a leading role in any ICSU initiative in the field.

Letters of invitation were circulated to participate in the Affiliate Membership Scheme from the beginning of 1986, and at least 16 member countries agreed to operate the Scheme, with several others commencing in 1987. Utilizing funds provided by ICSU and UNESCO, 500 Affiliate memberships were offered, at a nominal service charge of US-\$1 each, on a quota system to developing countries. In his statutory report on the state of the Union, President Schneider stressed the need for IUPAC to formulate a better overall strategy with respect to its presently largely uncoordinated involvement in and assistance to the scientific development of third world countries, possibly in conjunction with ICSU-COSTED.

Following the CHEMRAWN II Conference (1982) on Chemistry and World Food Supplies, the first of a series of workshops was held in Colombo, Sri Lanka, early in January 1985. The aim is to brief governmental officials and research scientists, and to promote follow-up action. During 1985 the Conference Perspectives and Recommendations volume from CHEMRAWN III (1984) on Resource Material Conversion was issued. CHEMRAWN IV — The Global Ocean, Its Chemistry and Resources — was postponed from 1985, so as to guarantee adequate funding, to ensure greater participation of developing country scientists, and to enable greater involvement of world leaders. On the joint recommendation of the CHEMRAWN Committee and Committee on Chemistry and Industry, IUPAC assumed, under its statutory objectives, a responsibility to address matters of chemical safety in their broadest aspects and in a continuing way. A small



The Officers at the Bureau meeting in Lyon.

study group was appointed and met in December to identify aims and initial activities for a IUPAC initiative.

Implementation of the contract and the spirit of collaboration with Blackwell Scientific Publications, the new main official publisher to the Union, were excellent. There was a smooth transfer in production of the journal *Pure and Applied Chemistry* (PAC) and only minor difficulties with the news magazine *Chemistry International* (CI). The first book productions issued (see Appendix) were well received. With the appointment of a full-time editor, there was further improvement in the presentation of IUPAC news and IUPAC-related material in CI in a readable and interesting format.

At Lyon discussions were held on how to achieve better coordination of IUPAC-sponsored symposia to avoid clashes in dates — some serious — especially when the topics are related. This will be difficult for symposia originating outside the Union. During November, IUPAC sponsored its first international symposium in China: Organic Chemistry of Medicinal Natural Products (see Appendix). It was decided to recommend six months prior to a meeting as the latest date for distribution of second circulars, which usually contain the official IUPAC statement on entry visas. The Council decided at Lyon to give careful consideration to the desirability of holding any more biennial IUPAC Congresses after 1989: it is now easier to obtain financial assistance to attend specialist rather than general meetings.

A considerable range of recommendations and reports was published during the year by IUPAC bodies (see Appendix). Synopses of 14 more sets of provisional recommendations on nomenclature and symbols were issued under the new trial system for handling this material, and the first set to be revised appeared in PAC in the autumn. Progress was made towards new editions of several major compendia: *Manual of Symbols and Terminology for Physicochemical Quantities and Units* (the Green Book) and an abbreviated (4-page) version thereof, *Nomenclature of Inorganic Chemistry* (the Red Book), and *Compendium of Analytical Nomenclature* (the Orange Book). The first edition of the *Compendium of Macromolecular Nomenclature* (the Purple Book) has been delayed in order to include additional material. Preparative work has been begun in earnest on a *Compendium of IUPAC Terminology* and should be completed in 1986.

In the field of chemical education, efforts were concentrated on extending low-cost equipment regional workshops. Following workshops held in Dhaka (Bangladesh) and Sri Lanka, the Committee on Teaching of Chemistry collaborated in workshops in Bathurst (Australia), Ljubljana (Yugoslavia) and Bombay (India). Proposals have been received to hold further workshops in Islamabad (Pakistan) and Beijing (China). Also there was collaboration with ICSU-CTS in a Conference on



The Council meeting in Lyon.

Science and Technology Education for Future Human Needs at Bangalore (India).

Appendix

The following recommendations on nomenclature and symbols were published in 1985:

1. Names, Symbols, Definitions and Units of Quantities in Optical Spectroscopy (Recommendations 1984), *PAC*, **57**, 105–120 (1985) — Commission on Molecular Structure and Spectroscopy and Commission on Quantities and Units in Clinical Chemistry.
2. Nomenclature for Regular Single-strand and Quasi Single-strand Inorganic and Coordination Polymers (Recommendations 1984), *PAC*, **57**, 149–168 (1985) — Commission on Macromolecular Nomenclature and Commission on Nomenclature of Inorganic Chemistry.
3. Definition of pH Scales, Standard Reference Values, Measurement of pH and Related Terminology (Recommendations 1984), *PAC*, **57**, 531–542 (1985) — Commission on Electroanalytical Chemistry and Commission on Electrochemistry.
4. Reporting Physisorption Data for Gas/Solid Systems with Special Reference to the Determination of Surface Area and Porosity (Recommendations 1984), *PAC*, **57**, 603–619 (1985) — Commission on Colloid and Surface Chemistry including Catalysis.
5. Reporting Experimental Pressure-area Data with Film Balances (Recommendations 1984), *PAC*, **57**, 621–632 (1985) — Commission on Colloid and Surface Chemistry including Catalysis.
6. Source-based Nomenclature for Copolymers (Recommendations 1985), *PAC*, **57**, 1427–1440 (1985) — Commission on Macromolecular Nomenclature.
7. Nomenclature, Symbols, Units and their Usage in Spectrochemical Analysis V: Radiation Sources (Recommendations 1985), *PAC*, **57**,

1453–1490 (1985) — Commission on Spectrochemical and Other Optical Procedures for Analysis.

8. Recommended Terms, Symbols, and Definitions for Electroanalytical Chemistry (Recommendations 1985), *PAC*, **57**, 1491–1505 (1985) — Commission on Electroanalytical Chemistry.

9. Nomenclature for Thermal Analysis IV (Recommendations 1985), *PAC*, **57**, 1737–1740 (1985) — Commission on Analytical Nomenclature.

The availability of the following provisional recommendations on nomenclature and symbols was announced in 1985:

- Recommended Terminology for Description of 'Carbon as a Solid': Part I, *CI*, No. 2, 14 (1985) — Commission on High Temperature and Solid State Chemistry.

- Formulae (Revision of *Nomenclature of Inorganic Chemistry*/The Red Book: Chapter I-4), *CI*, No. 2, 14 (1985) — Commission on Nomenclature of Inorganic Chemistry.

- Reporting Data on Adsorption from Solution at the Solid/Solution Interface, *CI*, No. 2, 14 (1985) — Commission on Colloid and Surface Chemistry including Catalysis.

- Specifications for Infrared Reference Spectra of Molecules in the Vapour Phase, *CI*, No. 3, 25 (1985) — Commission on Molecular Structure and Spectroscopy.

- A Descriptive Classification of the Electron Spectroscopies, *CI*, No. 4, 36 (1985) — Commission on Molecular Structure and Spectroscopy.

- Ions, Radicals and Salts (Revision of *Nomenclature of Inorganic Chemistry*/The Red Book: Chapter I-8), *CI*, No. 4, 36 (1985) — Commission on Nomenclature of Inorganic Chemistry.

- Elements, Atoms, and Groups of Atoms (Revision of *Nomenclature of Inorganic Chemistry*/The Red Book: Summary of Chapter I-3), *CI*, No. 4, 37 (1985) — Commission on Nomenclature of Inorganic Chemistry.

- Recommendations for Presentation of Thermodynamic and Related Data in Biology, *CI*, No. 4, 37 (1985) — IUB-IUPAB-IUPAC Commission on Biothermodynamics.

- A Classification of Linear Single-strand Polymers, *CI*, No. 4, 37 (1985) — Commission on Macromolecular Nomenclature.

- Nomenclature for Automated and Mechanized Analysis, *CI*, No. 4, 37 (1985) — Commission on Analytical Nomenclature and Commission on Quantities and Units in Clinical Chemistry.

- Electrochemical Corrosion Nomenclature, *CI*, No. 5, 34 (1985) — Commission on Electrochemistry.

- Terminology for Polymerizations Involving Chiral Monomers or Resulting in Optically Active Polymers, *CI*, No. 6, 41 (1985) — Commission on Macromolecular Nomenclature.

- Nomenclature of Polyanions (Revision of *Nomenclature of Inorganic Chemistry*/The Red Book: Chapter II-3), *CI*, No. 6, 41 (1985) — Commission on Nomenclature of Inorganic Chemistry.

- Recommended Terminology for Description of 'Carbon as a Solid': Part II, *CI*, No. 6, 41 (1985) — Commission on High Temperature and Solid State Chemistry.

The following technical reports by IUPAC bodies were published during the year:

1. Test Data for Normal Coordinate Calculations, *PAC*, **57**, 121–147 (1985) — Commission on Molecular Structure and Spectroscopy.

2. Standard Potentials of Amalgam Electrodes in Aqueous Solutions, Temperature Coefficients, and Activity Coefficients of Metals in Mercury, *PAC*, **57**, 169–179 (1985) — Commission on Electroanalytical Chemistry.

3. Microbial Adaptation to Pesticides, *PAC*, **57**, 389–403 (1985) — Commission on Pesticide Chemistry.

4. Purification of Solvents for Electroanalysis: Tetrahydrofuran and Dioxane, *PAC*, **57**, 633–638 (1985) — Commission on Electroanalytical Chemistry.

5. Relationship between Molecular Characteristics and Physical Properties of Linear Low Density Polyethylenes, *PAC*, **57**, 823–832 (1985) — Commission on Polymer Characterization and Properties.

6. Defects in the Molecular Structure of Polyvinylchloride and their Relation to Thermal Stability, *PAC*, **57**, 833–844 (1985) — Commission on Polymer Characterization and Properties.

7. Identification and Control of Purity of Acid-Base Indicators, *PAC*, **57**, 845–848 (1985) — Commission on Analytical Reactions and Reagents.

8. Separation and Preconcentration of Trace Substances: Part IV. New Type of Flotation of Ion-association Compounds of Complexes of Multi-charged Anions with Basic Dyes (Based on Platinum Metals as Examples), *PAC*, **57**, 849–854 (1985) — Commission on Microchemical Techniques and Trace Analysis.

9. Recommended Methods for the Purification of Solvents and Tests for Impurities: Methanol and Ethanol, *PAC*, **57**, 855–864 (1985) — Commission on Electroanalytical Chemistry.

10. Criteria for Standardization of pH Measurements in Organic Solvents and Water + Organic Solvent Mixtures of Moderate to High Permittivities, *PAC*, **57**, 865–876 (1985) — Commission on Electroanalytical Chemistry.

11. Recommendations for the Determination of pH in Low Ionic Strength Fresh Waters, *PAC*, **57**, 877–886 (1985) — Commission on Electroanalytical Chemistry.
12. Procedures for Testing pH Responsive Glass Electrodes at 25, 37, 65 and 85°C and Determination of Alkaline errors up to 1 mol dm⁻³, *PAC*, **57**, 887–898 (1985) — Commission on Electroanalytical Chemistry.
13. Standard Method for the Determination of Total Sterols in Fats and Oils (Including Results of a Collaborative Study), *PAC*, **57**, 899–904 (1985) — Commission on Oils, Fats and Derivatives.
14. Thermodynamic Functions of Transfer of Single Ions from Water to Nonaqueous and Mixed Solvents: Part 2. Enthalpies and Entropies of Transfer to Nonaqueous Solvents, *PAC*, **57**, 1103–1128 (1985) — Commission on Electroanalytical Chemistry.
15. Thermodynamic Functions of Transfer of Single Ions from Water to Nonaqueous and Mixed Solvents: Part 3. Standard Potentials of Selected Electrodes, *PAC*, **57**, 1129–1132 (1985) — Commission on Electroanalytical Chemistry.
16. General Aspects of Trace Analytical Methods: Part VI. Trace Analysis of Semiconductor Materials, Part A: Bulk Analysis, *PAC*, **57**, 1133–1152 (1985) — Commission on Microchemical Techniques and Trace Analysis.
17. General Aspects of Trace Analytical Methods: Part VII. Trace Analysis of Semiconductor Materials, Part B: Distribution Analysis, *PAC*, **57**, 1153–1170 (1985) — Commission on Microchemical Techniques and Trace Analysis.
18. An Assessment of the Melting, Boiling, and Critical Point Data of the Alkali Metals, *PAC*, **57**, 1407–1426 (1985) — Commission on High Temperature and Solid State Chemistry.
19. A Collaborative Study of the Rheological Properties and Unstable Melt Spinning Characteristics of Linear and Branched Polyethylene Terephthalates, *PAC*, **57**, 1441–1452 (1985) — Commission on Polymer Characterization and Properties.
20. Determination of Mercury in Foodstuffs, *PAC*, **57**, 1507–1514 (1985) — Commission on Food Chemistry.
21. Determination of Triglycerides in Fats and Oils: Results of a Collaborative Study and the Standardized Method, *PAC*, **57**, 1515–1522 (1985) — Commission on Oils, Fats and Derivatives.
22. Critical Evaluation of Model Ecosystems, *PAC*, **57**, 1523–1536 (1985) — Commission on Pesticide Chemistry.
23. *Standard Potentials in Aqueous Solution* (published in book form by Marcel Dekker, New York, 1985) — Commissions on Electrochemistry and Electroanalytical Chemistry.
24. Chemical Data Series — No. 30: *Handbook of Thermodynamic and Transport Properties of Alkali Metals* (published in book form by Blackwell Scientific Publications, Oxford, 1985) — Commission on High Temperature and Solid State Chemistry.
25. Chemical Data Series — No. 31: *International Thermodynamic Tables of the Fluid State — Volume 8: Chlorine* (published in book form by Blackwell Scientific Publications, Oxford, 1985) — Commission on Thermodynamics.
26. Chemical Data Series — No. 32: *Enthalpies of Vaporization of Organic Compounds* (published in book form by Blackwell Scientific Publications, Oxford, 1985) — Commission on Thermodynamics.
27. Solubility Data Series — Volume 16/17: *Antibiotics: I. — Lactam Antibiotics* (published in book form by Pergamon Press, Oxford, 1985) — Commission on Solubility Data.
28. Solubility Data Series — Volume 19: *Cumulative Index. Volumes 1–18* (published in book form by Pergamon Press, Oxford, 1985) — Commission on Solubility Data.
29. Solubility Data Series — Volume 20: *Halogenated Benzenes, Toluenes and Phenols with Water* (published in book form by Pergamon Press, Oxford, 1985) — Commission on Solubility Data.
30. Solubility Data Series — Volume 21: *Ammonia, Amines, Phosphine, Arsine, Stibine, Silane, Germane and Stannane in Organic Solvents* (published in book form by Pergamon Press, Oxford, 1985) — Commission on Solubility Data.
31. Solubility Data Series — Volume 22: *Scandium, Yttrium, Lanthanum and Lanthanide Halides in Nonaqueous Solvents* (published in book form by Pergamon Press, Oxford, 1985) — Commission on Solubility Data.

Thirty symposia were sponsored by IUPAC in 1985, namely:

1. POLYMER 85: International Symposium on Characterization and Analysis of Polymers, Melbourne/Australia, February (13 Papers published in *PAC*, **57** (7), 1985 and 2 Papers in *PAC*, **57** (11), 1985).
2. 5th International Symposium on Hydrogen in Metals, Belfast/Northern Ireland, March (Proceedings to be published in *Zeitschrift für Physikalische Chemie Neue Folge*, 1986).
3. 8th International Conference on Solid Compounds of Transition Elements, Vienna/

Austria, April (*PAC*, **57** (10), 1985).

4. 2nd International Symposium on Analytical Chemistry in the Exploration, Mining and Processing of Materials, Pretoria/Rep. of S. Africa, April (Proceedings to be published by Blackwell Scientific Publications, Oxford, 1986).
5. International Symposium on Bio-Organic Chemistry, New York City/USA, May (Proceedings to be published in *Annals of New York Academy of Sciences*, New York, 1986).
6. International Symposium on Non-crystalline Order in Polymers, Naples/Italy, May (*PAC*, **57** (11), 1985).
7. International Conference on the Theory of the Structures of Non-crystalline Solids, Bloomfield Hills/USA, June (Proceedings published in *Journal of Non-crystalline Solids*, Vol. 75, Nos 1–3 (Oct. 1985), pp. 1–516 by North-Holland Physics Publishing, Amsterdam, 1985).
8. 5th International Conference on Surface and Colloid Science, Potsdam/USA, June (No Conference Proceedings to be published).
9. 7th International Symposium on Plasma Chemistry, Eindhoven/Netherlands, July (*PAC*, **57** (9), 1985).
10. 28th Microsymposium on Macromolecules 'Polymer Composites', Prague/Czechoslovakia, July (*PAC*, **57** (11), 1985).
11. 3rd International Symposium on Organic Chemistry Directed Toward Organic Synthesis, Kyoto/Japan, July (*PAC*, **57** (12), 1985).
12. 7th International Symposium on Solute–Solute–Solvent Interactions, Reading/UK, July (*PAC*, **57** (8), 1985).
13. 5th International Symposium on Novel Aromatic Compounds, St Andrews/UK, July (*PAC*, **58** (1), 1986).
14. 6th International Symposium on Mycotoxins and Phycotoxins, Pretoria/Rep. of S. Africa, July (*PAC*, **58** (2), 1986).
15. 10th International Congress on Heterocyclic Chemistry, Waterloo/Canada, August (Proceedings published as a special issue of *Journal of Heterocyclic Chemistry*, Vol. 8, 1985).
16. 2nd International Symposium on Hydrothermal Reactions, University Park, Penn./USA, August (no Symposium Proceedings to be published).
17. 7th International Symposium on Cationic Polymerization and Related Processes, Jena/GDR, August (Proceedings to be published as Vol. 3 in the series Macromolecular Symposia to *Die Makromolekulare Chemie* by Hüthig & Wepf Verlag, Basel, 1986).
18. 30th International Symposium on Macromolecules, The Hague/Netherlands, August (Proceedings published as Vol. 1 in the series Macromolecular Symposia to *Die Makromolekulare Chemie* by Hüthig & Wepf Verlag, Basel, 1986).
19. 8th International Conference on Thermal Analysis, Bratislava/Czechoslovakia, August (Proceedings by Vydala ALFA, Bratislava, 1985).
20. 8th International Conference on Chemical Education, Tokyo/Japan, August (Proceedings to be published by Blackwell Scientific Publications, Oxford, 1986).
21. International Symposium on Applications of Mathematical Concepts to Chemistry, Dubrovnik/Yugoslavia, September (Proceedings published by Ellis Horwood Ltd, Chichester, 1986).
22. 5th International Symposium on Marine Natural Products, Paris/France, September (*PAC*, **57** (3), 1986).
23. 3rd Noordwijkerhout Symposium on Innovative Approaches in Drug Research, Noordwijkerhout/Netherlands, September (Proceedings published as Vol. 9 in the Pharmacochemistry Library Series by Elsevier, Amsterdam, 1986).
24. 2nd International Workshop on Vapour–Liquid Equilibria in 1-Alkanol + *n*-Alkane Mixtures, Paris/France, September (Proceedings to be published as a special issue of the journal *Fluid Phase Equilibria*, 1986).
25. 12th International Conference on Organometallic Chemistry, Vienna/Austria, September (*PAC*, **58** (4), 1986).
26. 10th International Mass Spectrometry Conference, Swansea/UK, September (Proceedings to be published in the series *Advances in Mass Spectrometry* by John Wiley & Sons, Chichester, 1986).
27. 30th IUPAC Congress, Manchester/UK, September (No Conference Proceedings to be published).
28. 24th Colloquium Spectroscopicum Internationale, Garmisch-Partenkirchen/FRG, September (Proceedings to be published in a special issue of *Zeitschrift für Analytische Chemie*, 1986).
29. International Conference on the Applications of the Mössbauer Effect, Leuven/Belgium, September (Proceedings published as 3 vols. by J. C. Baltzer AG. Scientific Publishing Company, Basel, 1986).
30. International Symposium on Organic Chemistry of Medicinal Natural Products, Shanghai/China, November (*PAC*, **58** (5), 1986).

The function of the Solubility Data Project, operated by Commission on Solubility Data (V.8), Analytical Chemistry Division, is to produce comprehensive compilations and in-depth critical evaluations of published solubility data. The Project has established and developed an innovative approach in which the primary literature data are reported in an integrated manner, combining the important features of the secondary and the tertiary literature.

Fundamental to the philosophy of the project is the recognition that the basic element of strength is the active participation of career scientists in it. Consolidating primary data, producing a truly critically evaluated set of numerical data, and synthesizing data in a meaningful relationship are demands considered worthy of the efforts of top scientists. Career scientists, who themselves contribute to science by their involvement in active scientific research, are the backbone of the project. The scholarly work is commissioned to recognized authorities, involving a process of careful selection in the best tradition of IUPAC. This selection in turn is the key to the quality of the output. These top experts are expected to view their specific topics dispassionately, paying equal attention to their own contributions and to those of their peers. They digest literature data into a coherent story by weeding out what is wrong from what is believed to be right. To fulfil this task, the evaluator must cover *all* relevant open literature. No reference is excluded by design and every effort is made to detect every bit of relevant primary source. Poor quality or wrong data are mentioned and explicitly disqualified as such. In fact, it is only when the reliable data are presented alongside the unreliable data that proper justice can be done. The user is bound to have incomparably more confidence in a succinct evaluative commentary and a comprehensive review with a complete bibliography to both good and poor data.

Solubility Data Series

The output of the Project, published by Pergamon Press as the *Solubility Data Series*, is made up of volumes of comprehensive and critically evaluated solubility data on chemical systems in clearly defined areas. The standard practice is that the treatment of any given solute-solvent system consists of compiled Data Sheets and Critical Evaluation. Data Sheets constitute the compilation part of the volume and present the best experimental data in the primary literature. Generally speaking, data sheets such as the one shown in Appendix I are given only to the best and endorsed data which are subsequently used in a critical evaluation process. The critical evaluation process part consists of a verbal text discussing the numer-



Prof. A. S. Kertes,
Chairman of the
Commission on
Solubility Data
(V.8).

ical solubility information appearing in the primary source, Analysing the numerical data and fitting them with suitable statistical tests to mathematical function. From such harmonized data, a set of recommended solubility data is compiled, including, whenever possible, weighted average and standard deviation. Sets of smoothing equations and graphical plots are frequently part of the presentation of recommended data. A sample of the critical evaluation of mutual solubility data in the bromobenzene-water system at various temperatures is shown in Appendix II.

The first volume in the *Solubility Data Series* to appear was that on helium and neon in 1979. By the end of 1985, 22 volumes were published with a total of over 8000 pages. An additional four volumes, containing over 1700 pages, are scheduled to appear in 1986. The running titles and editors of volumes 1 to 26 are shown in Table 1. Summaries of the contents and publication details of the four most recently published volumes are given below.

The publication rate in 1987 will nearly double that of earlier years; among the volumes scheduled are those on Methane, Metal Alkanoates, Sulfonamides, Barbiturates, Hydrogen Sulfide, Hydrogen Halides, Hydrocarbons, Halogenated Aliphatic Hydrocarbons.

Single volumes of 550 pages or less are uniformly priced at \$100. On a yearly subscription basis the price is \$300 for four volumes. With certain restrictions, single volumes are available to individuals at a rate of \$35.

Table 1. Solubility Data Series.

Vol.	Title	Editors
1.	Helium and Neon	H. L. Clever
2.	Krypton, Xenon and Radon	H. L. Clever
3.	Silver Azide, Cyanide, Cyanamides, Cyanate, Selenocyanate and Thiocyanate	M. Salomon
4.	Argon	H. L. Clever
5/6.	Hydrogen and Deuterium	C. L. Young
7.	Oxygen and Ozone	R. Battino
8.	Oxides of Nitrogen	C. L. Young
9.	Ethane	W. Hayduk
10.	Nitrogen and Air	R. Battino
11.	Alkali Metal, Alkaline Earth Metal and Ammonium Halides	B Scrosati & C. A. Vincent
12.	Sulfur Dioxide, Chlorine, Fluorine and Chlorine Oxides	C. L. Young
13.	Scandium, Yttrium, Lanthanum and Lanthanide Nitrates	S. Siekerski, T. Mioduski & M. Salomon
14.	Alkaline Earth Metal Halates	H. Miyamoto, M. Salomon & H. L. Clever
15.	Alcohols with Water	A. F. M. Barton
16/17.	Antibiotics. I. β -Lactam Antibiotics	E. Tomlinson & A. Regosz
18.	Tetraphenylborates	O. Popvych
19.	Cumulative Index: Volumes 1–18	C. L. Young
20.	Halogenated Benzenes, Toluenes and Phenols with Water	A. L. Horvath and F. W. Getzen
21.	Ammonia, Amines, Phosphine, Arsine, Stibine, Silane, Germane and Stannane in Organic Solvents	C. L. Young & P. G. T. Fogg
22.	Scandium, Yttrium, Lanthanum and Lanthanide Halides in Nonaqueous Solvents	T. Mioduski & M. Salomon
23.	Copper, Silver, Gold and Zinc, Cadmium, Mercury Oxides and Hydroxides	T. P. Dirkse
24.	Propane, Butane and 2-Methylpropane	W. Hayduk
25.	Metals in Mercury	C. Hirayama, Z. Galus & C. Guminski
26.	Sulfites, Selenites and Tellurates	M. R. Masson, H. D. Lutz & B. Engelen

Please give us a hand

And finally the invitation: now that IUPAC has thrown its doors open to the world's chemists via the new IUPAC Affiliate Membership Scheme it is expected that many more chemists will become involved in the Union's Affairs. In that cooperative spirit, we are presently recruiting experts in all fields of chemistry and chemical engineering wishing to join the project and contribute to this pioneering effort of the Union. Your enquiries addressed to *Chemistry International* will receive our immediate attention. Please come on board, give us a hand.

Ammonia, Amines, Phosphine, Arsine, Stibine, Silane, Germane and Stannane in Organic Solvents

This is Volume 21 in the series. It presents a comprehensive collection and critical evaluation of solubility data published prior to June 1983 for the compounds of the title. Emerging patterns of solubility behaviour for comparable systems are indicated. This book will be of interest to physical, inorganic, organic and analytical chemists, and chemical engineers.

Contents: Foreword, Preface. The solubility of gases in liquids. Ammonia. Methanamine. *N*-Methylmethanamine. *N,N*-Dimethylmethanamine. Deuterated methanamines. Other amines. Phosphine. Arsine. Stibine. Silane. Germane. Stannane. System index. Chemical Abstracts registry number index. Author index.

The book is edited by C. L. Young and P. G. T. Fogg and published by Pergamon Press, Oxford, UK, 1985. 360 pp. 20 illus. approx. 200 lit refs approx, price US-\$100.00, £64.00, ISBN 0 08 026177 9.

Scandium, Yttrium, Lanthanum and Lanthanide Halides in Nonaqueous Solvents

This is Volume 22 in the series. It includes solubilities of the title compounds in both organic and inorganic solvents, and in mixed solvents containing water as the minor constituent, with complete literature coverage through 1984. This volume will be of interest to inorganic, physical, nuclear and analytical chemists, chemical engineers and researchers in nuclear and related industries.

Contents: Foreword. Preface. Introduction to the solubility of solids in liquids. Scandium chloride

and bromide. Yttrium bromide, chloride and iodide. Lanthanum fluoride, chloride, bromide and iodide. Cerium fluoride, chloride, bromide and iodide. Praseodymium fluoride, chloride, bromide and iodide. Neodymium fluoride, chloride, bromide and iodide. Samarium fluoride, chloride, bromide and iodide. Europium fluoride, chloride and bromide. Gadolinium fluoride, chloride, bromide and iodide. Terbium fluoride, chloride, bromide and iodide. Dysprosium fluoride, chloride, bromide and iodide. Holmium fluoride, chloride and bromide. Erbium fluoride, chloride and bromide. Thulium chloride and bromide. Ytterbium fluoride, chloride, bromide and iodide. Lutetium chloride and bromide. System index. Chemical Abstracts registry number index. Author index.

The book is edited by T. Mioduski and M. Salomon and published by Pergamon Press, Oxford, UK, 1985. 418 pp. 250 lit. refs. approx., price US-\$100.00, £64.00. ISBN 0 08 030709 4.

Copper, Silver, Gold and Zinc, Cadmium, Mercury Oxides and Hydroxides

This is Volume 23 in the series. Interest in the title compounds has fallen into three phases: initial study of their solution chemistry, study of their role in the electrode reactions of alkaline batteries during and since World War II, and present concern over the mechanisms by which these elements can enter the environment through dissolution processes, sometimes with toxic results. This volume provides a complete compilation of solubility data published up to 1984, including all pertinent articles, together with critical evaluation of the data. Almost all the measurements relate to aqueous systems. This book will be of interest to inorganic, physical and analytical chemists, electrochemists and those concerned with environmental quality.

Contents: Foreword. Preface. Introduction: the solubility of solids in liquids. Copper(I) oxide. Copper(II) oxide and hydroxide. Silver(I) oxide. Silver(II) oxide. Gold(III) hydroxide. Zinc oxide and hydroxide. Cadmium oxide and hydroxide. Mercury(II) oxide. System Index. Chemical Abstracts registry number index. Author index.

The book is edited by T. P. Dirkse and published by Pergamon Press, Oxford, UK, 1986. 380 pp. 250 lit. refs., price US-\$100.00, £64.00. ISBN 0 08 032497 5.

Propane, Butane and 2-Methylpropane

This is Volume 24 in the series. It considers published solubility data for these three gases in a variety of solvent systems under various ex-

perimental conditions. The literature has been covered to the end of 1983. For each published paper, a compilation sheet gives the experimental solubility, the method of its determination, the purity of the materials and the experimental error where possible; the data are critically assessed by experts and classified accordingly. The book will be of interest to physical, analytical and environmental chemists, polymer scientists and gas technologists.

Contents: Foreword. Preface. The solubility of gases in liquids: Introductory information. Propane in water. 2-Methylpropane in water. Propane in water at high pressure. Butane in water at high pressure. Propane and butane in heavy water. Aqueous mixed solvent solutions, mainly electrolytes. Propane in non-aqueous mixed solvent solutions. Alkanes. Alkanes at high pressure. Non-polar solvents excluding alkanes and organohalides. Non-polar solvents excluding alkanes and organohalides at high pressure. Organohalides. Nitrogen-containing solvents. Alcohols. Other polar solvents. Other polar solvents at high pressure. Common solvents, and aqueous solutions or suspensions of biological substances. Mixed hydrocarbon solvents at high pressure. System index. Chemical Abstracts Registry number index. Author index.

The book is edited by W. Hayduk and published by Pergamon Press, Oxford, UK, 1986. 447 pp. 500 lit. refs., price US-\$100.00, £64.00. ISBN 0 08 029202.



Appendix I. Sample Compilation: initial sheet (liquid-liquid).

COMPONENTS:		EVALUATOR:	
(1)	Bromobenzene; C ₆ H ₅ Br; [108-86-1]	A. L. Horvath, Imperial Chemical Industries Limited, Runcorn, England.	
(2)	Water; H ₂ O; [7732-18-5]	January 1983.	

CRITICAL EVALUATION: (Continued)			
Table 1. Solubility of Bromobenzene in Water.			
T/K	10 ³ mol(1)/dm ³	10g(1)/kg	10 ⁵ x(1)
283.15	2.47	3.87	4.45
288.15	2.58	4.05	4.65
293.15	2.70	4.24	4.87
298.15	2.83	4.45	5.11
303.15	2.96	4.67	5.36
308.15	3.11	4.91	5.63
313.15	3.26	5.16	5.92

Table 2. Solubility of Water in Bromobenzene.			
T/K	10 ² mol(2)/dm ³	10g(2)/kg	10 ³ x(2)
283.15	1.16	1.39	1.21
288.15	1.43	1.72	1.50
293.15	1.76	2.12	1.84
298.15	2.13	2.58	2.25
303.15	2.58	3.14	2.73
308.15	3.09	3.78	3.29
313.15	3.69	4.53	3.94

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9.	Jones, J. R.; Monk, C. B. <i>J. Chem. Soc.</i> <u>1963</u> , <i>Part III</i> , 2633-5.
10.	Wing, J.; Johnston, W. H. <i>J. Am. Chem. Soc.</i> <u>1957</u> , <i>79</i> (4), 864-5.
11.	Yalkowsky, S. H., Personal Communication, <u>1979</u> .
12.	Eidinoff, M. L. In "Production of Heavy Water", National Nuclear Energy Series Division III-Vol. 4F, Murphy, G. M.; Urey, H. C.; Kirshenbaum, I., Eds.; McGraw-Hill: New York, <u>1955</u> ; Part II, Chapter 7, pp 129-44.

Appendix II. Critical evaluation of mutual solubility data in the bromobenzene–water system.

COMPONENTS: (1) Bromobenzene; C_6H_5Br; [108-86-1] (2) Water; H_2O; [7732-18-5]	EVALUATOR: A. L. Horvath, Imperial Chemical Industries Limited, Runcorn, England. January 1983.
CRITICAL EVALUATION: The solubility of bromobenzene in water has been reported in eight published sets of data (1-6,14,15). The solubility behavior as a function of temperature is illustrated in Figure 1. Some rather serious discrepancies between the various solubility measurements are evident in the figure. The solubility of water in bromobenzene has been measured by several investigators between 1932 and 1963 and reported in five published sets of data (7-10,14). As shown in Figure 2, which gives the solubility behavior relative to Absolute temperature, the agreement among experimental values is reasonable. Of the more recent works, that of Nelson and Smit (4) reported the solubility data for temperatures in the range between 278 and 318 K. However, despite the equilibration period of 24 hours (which might not have been long enough), the solubility values obtained are substantially lower than those found by the earlier investigators. It is not possible to establish any shortcomings of their experimental procedure from the very brief description. No information was provided on the source and purity of materials used. Also, it was not indicated whether or not a water stripper had been employed for the analysis of the very dilute aqueous solutions by gas chromatography, or whether or not an internal standard had been used for the calibration of the gas chromatograph which employed a flame ionization detector. However, the authors agreed to re-examine their raw data in order to verify the reported values (13). Consequently, for the present evaluation, their results have not been considered for inclusion in the selected solubility values. The reported solubility value of Yalkowsky et al. is too low. This could be due to an insufficient time allowed for saturation equilibrium. According to the authors, the accuracy of the experimental determination was ± 10 percent (11). The remaining reported data, that of Andrews and Keefer (1), Gross and Saylor (2), Hine et al. (3), and Vesala (5,15), have been correlated against Absolute temperature using a normal polynomial equation of second degree. In the regression, twice as much weight was assigned to the data of Vesala as was assigned to the remaining data. The equation below represents the solubility of bromobenzene in water between 283 and 308 K: $S_1(g(1)/kg) = 1.8293 - 1.35675 \times 10^{-2} T + 2.99322 \times 10^{-5} T^2 \quad [1]$ The values calculated from equation [1] for the saturation of bromobenzene in water in the range of temperatures between 283 and 313 K together with corresponding molarities and mole fractions are given in Table 1. Also, the solubility values calculated from equation [1] are shown in Figure 1 as a solid line along with the measured values. The solubility of water in bromobenzene has been reported in the temperature range between 288 and 308 K in five investigations. The original report from Columbia University by Hutchinson and Lyon (8) has been lost, and all details reported here on that work have been taken from a secondary source (12). The single value from Hutchinson and Lyon is too high in relation to other reported determinations at the same temperature so it was not included in the correlation of the data against temperature. On the other hand, the solubility reported by Donahue and Bartell (14) appears too low and this value also was not used in the correlation. The reported values of Bell (7), Jones and Monk (9), and Wing and Johnston (10) are represented by the equation: $\log_{10} x(2) = 2.43149 - 1514.54/T \quad [2]$ In this equation, $x(2)$ is the mole fraction solubility of water in the water–bromobenzene system and T is the Absolute temperature. The calculated solubility values in the 283 to 308 K range are shown in Figure 2 as a solid line along with the reported values. The calculated mole fraction values for the solubility of water in bromobenzene from equation [2] are included in Table 2 together with the corresponding molarities and $g(2)/kg$ values in the temperature range between 283 and 313 K.	

Provisional Recommendations

IUPAC seeks your comments

In this section we publish synopses of IUPAC's latest provisional recommendations on nomenclature and symbols. All comments on these recommendations are welcome and will be taken into consideration. The final revised versions are published in *Pure and Applied Chemistry* and synopses of these published in *CI* as recent reports. If you would like to comment on the provisional recommendations please write to your nearest regional centre requesting a copy of the full report. Copies are not available from the Secretariat. The most up-to-date list of regional centres was published in *CI*, No 3. p 28 (1986).

Nomenclature of inorganic chemistry (the Red Book): Revision of 2nd Edition (1970)

Chapter I-1: General Aims, Functions and Methods of Nomenclature

This introductory chapter deals with the history, general aims and functions of inorganic chemical nomenclature. Together with the Grammar Chapter (I-2), it provides the reader with a general introduction before confronting the details of rules and their applications.

The chapter begins with a brief historical survey of inorganic chemical nomenclature from its birth to the present day. The general aims and functions are then described, and the terms 'semi-systematic' and 'systematic' are explained. It is then shown how and why it became necessary to establish rules and explains the methodology for name construction.

Various systems of inorganic nomenclature are presented, with examples. The discussion covers binary, additive, and replacement nomenclature, and also systems used in organic chemistry and pertinent minor systems such as substitutive, subtractive and index nomenclatures.

The final section contains information about internal collaboration on nomenclature matters, on the formation of working groups on nomenclature, and on the role which IUPAC assumed in this endeavour. This information is not generally known to the chemical community. A survey of the achievements of IUPAC commissions since 1921 is presented, together with bibliographical reference to all the inorganic nomenclature documents published by Commission II.2.

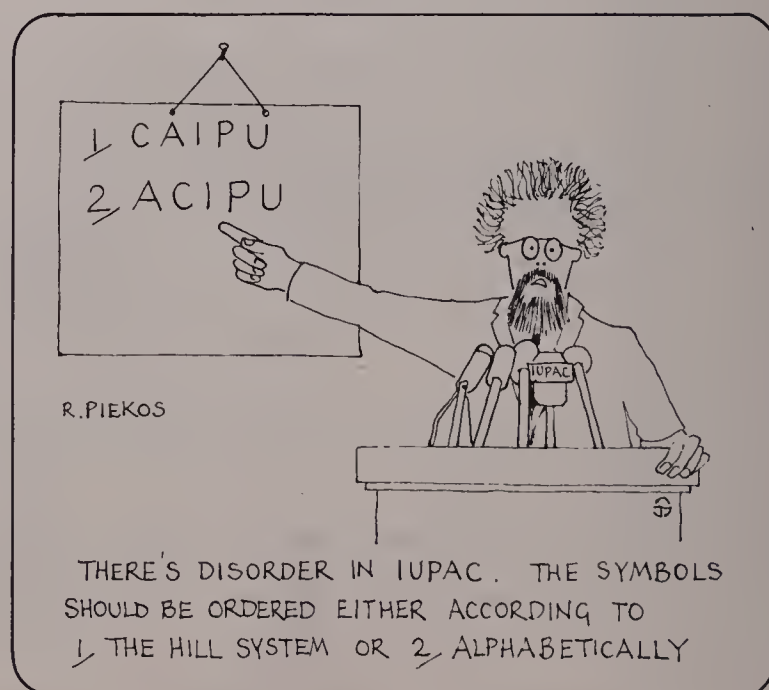
Chapter I-5: Names Based on Stoichiometry

This chapter serves as a guide in writing stoichiometric names correctly, including derivation of names, their assembly into the correct sequence and the indication of proportions.

Rules for the names of monoatomic, polyatomic and heteropolyatomic electropositive and electronegative constituents as well as of addition compounds are included. The order of citation in names is based on the alphabetical order of the names of the electropositive and electronegative constituents, respectively. The proportions of the constituents can be indicated either by multiplicative prefixes (numerical prefixes and multiplicative numerals) or by Stock or Ewens-Bassett numbers.

There are no changes in this chapter from that in the 2nd edition; however, discussion is more extensive and many points are explained precisely. The chapter contains numerous examples.

Comments on both chapters should be sent before 30 April 1987 to the Commission Secretary, Dr E. Samuel, Laboratoire de Chimie Organique Industrielle, École Nationale Supérieure de Chimie, 11 rue Pierre et Marie Curie, F-75231 Paris Cédex 05, France.



Nomenclature for cyclic organic compounds with contiguous formal double bonds (the δ -convention)

Substitutive (organic) nomenclature requires that the number of hydrogen atoms, if any, on each skeletal atom of a parent be known unambiguously. Trivial or semi-systematic names are used to denote many rings and ring systems containing the maximum number of non-cumulative double bonds. In order to use substitutive nomenclature and the same skeletal names when formal cumulative double bonds, actual or theoretical, are present in these rings and ring systems, a method for indicating the location of a cumulative double bond system is required. Techniques used up to now are either cumbersome or tend to use established techniques in ways other than for which they were designed. The λ -convention (*PAC*, **56** (6), 769–778, 1984) for specifying non-standard valency states of skeletal atoms, although useful, is not, by itself sufficient for this purpose.

These rules provide a method for unambiguously denoting the presence of cumulative double bonds at a skeletal atom in a ring or ring system that otherwise has the maximum number of non-cumulative double bonds. When combined with the λ -convention, where necessary, the number of

hydrogen atoms available for substitution on such skeletal atoms is unambiguously known. The basic principles of this method were introduced briefly in Section D as revised for publication in the 1979 edition of the IUPAC Organic Nomenclature Rules (Pergamon Press).

The δ -convention is fully consistent with the fundamental principles of substitutive nomenclature which is based on formalized bonding in structural diagrams and is applicable to organic derivatives of inorganic chains and rings. It consists of a symbol, δ^c , where c is an arabic number representing the number of double bonds attached to the skeletal atom indicated by the preceding locant. A non-standard valence state of the skeletal atom is given by the λ -convention, where necessary.

Comments on the report are welcome and should be sent before 31 May 1987 to the Secretary of Commission on Nomenclature of Organic Chemistry, Dr W. H. Powell, Chemical Abstracts Service, POB 3012, 2540 Olentangy River Road, Columbus, Ohio 43210, USA.

IUPAC Publications

Guidelines for the Development of Standard Methods by Collaborative Study

These Guidelines are subtitled 'The Organization of Interlaboratory Studies and a simplified approach to the Statistical Analysis of Collaborative Study Results'. They were prepared for the Commission on Oils, Fats and Derivatives (VI.3) and ISO/TC 34/SC 11 by Commission Secretary W. Dennis Pocklington. The document, which is based on previous drafts distributed by IUPAC Commission VI.3 and ISO TC/34, consists of two complementary parts:

Part I: Organisation of a Collaborative Study

Part II: Statistical Analysis of Collaborative Study Results

Part I (14 pages) covers all the important aspects of the organization of a collaborative study in five sections, viz: number of participants required, preparation of the text of the method to be studied, preparation of the samples, instructions for the participants and the report of the coordinator on the outcome of the study. Four different models for collaborative studies are described:

- (1) a uniform-level study in which duplicate determinations (either known or 'blind') are carried out on each sample.
- (2) a split-level study in which single determinations are made on each of the two sublevel samples provided for the split-level.
- (3) a double split-level study in which blind duplicate determinations are made on each of the two sublevel samples provided for each of three split-levels.
- (4) a replicate analysis study in which more than two known replicate determinations are required for each sample.

Each of the models listed above has been recommended by one or more of the following standards organizations:

Association of Official Analytical Chemists (AOAC)

International Dairy Federation (IDF/FIL)

International Standards Organisation (ISO)

International Union for Pure and Applied

Chemistry (IUPAC)
Office International du Cacao et du Chocolat
(OICC/AIFC).

The document takes into account all the recent publications on the subject of collaborative studies that have been issued by the above organizations.

Part II (114 pages) is divided into six sections. The first four sections provide easy-to-follow instructions for the statistical analysis of results obtained from each of the models mentioned above. Tables are provided (in a form in which they can be copied) for ease of tabulating the results and carrying out the calculations involved.

The fifth section of Part II (55 pages) gives calculated examples for each of the four collaborative study models and the final section outlines examples of the rapid calculation of statistical parameters for the four models using a scientific calculator having standard deviation facilities.

A brief reference is made to the use of computer programs in statistical analysis, and a comprehensive index, allowing all the topics covered in the document to be readily located, completes the document.

The document, spiral-bound with durable cover, is available from the Library, Laboratory of the Government Chemists, Cornwall House, Waterloo Road, London SE1 8XY, UK. Price £25 (including postage). LGC Publication No. 1986 OP 001. ISBN 0 948926 00 7.

Bulletin of Chemical Thermodynamics 26/1983

This latest edition of the bulletin, published in 1985, contains the annual index, bibliography and review of published and unpublished research in the intersecting areas of thermodynamics and chemistry. It was prepared under the auspices of Commission on Thermodynamics, I.2.

Thermodynamic data find such wide use in industry, academic research, and governmental programmes that efforts to catalogue their applications are frustrated by the immensity of the task. While this has been true for many decades, the current crises in energy, environment, materials supply, and other areas have greatly accentuated the need for reliable thermodynamic data. New materials and new processes in extended temperature and pressure ranges all contribute to the demand for more and better data.

The organized compilation of thermodynamic data has a long and distinguished history. Many data centres and other groups throughout the world are actively compiling data from the primary literature, critically evaluating these data, and publishing tables of various types. However, such work is slow and painstaking, and most of the thermodynamic tables now available are far out of date.

Translation of Green Book

The *Manual of Symbols and Terminology for Physicochemical Quantities and Units* (see *PAC*, Vol. 51, No. 1, pp. 1–36, 1979) popularly known as the “Green Book” has been translated and published as notes for university students in Hungary. A Finnish translation has also been published by the Association of Finnish Chemical Societies, Helsinki.

Russian translations

A version of the *Compendium of Analytical Nomenclature* (Orange Book, 1978) has been translated into Russian and published under the title *Analytical Chemistry*. A Russian translation of the “Glossary of Terms used in Physical Organic Chemistry” (1982 Revision) has also appeared in the same series. The glossary, which was compiled and edited by Prof. V. Gold in conjunction with the Commission on Physical Organic Chemistry (III.2) appeared in *PAC*, Vol. 55, No. 8, pp. 1281–1371, 1983. The Commission on Thermodynamics’ (I.2) Provisional Recommendations on “Assignment and Presentation of Uncertainties of the Numerical Results of Thermodynamics Measurements” (*PAC*, Vol. 53, No. 9, pp. 1801–1825, 1981) has also been translated into Russian.

Since the results of new measurements are published in thousands of different journals and report series, there is a clear need to alert users of data to new results of interest to them — results which may not get into the standard tabulations for many years.

The *Bulletin of Chemical Thermodynamics* fills this need for up-to-date information. Both of its major parts, the Reports of current research and the Substance–Property Index to the recent literature, are valuable to the user. The thermodynamics laboratories contributing to the Reports are to be commended: they help others avoid unnecessary measurements by prompt announcement of recent work. The groups that prepare the various Sections of the Index also are providing a valuable product — a carefully codified guide to published thermodynamic and thermochemical measurements, indexed by substance and property, which is the type of index most frequently wanted by searchers of thermodynamic data.

Bulletin of Chemical Thermodynamics 26/1983 is published by Thermochemistry, Inc. Stillwater, OK, USA, 1985. viii + 584 pp. ISSN: 0149 2268. Price US-\$40.00.

Recent Reports

In this section we publish summaries of the most recent IUPAC Recommendations on Nomenclature and Symbols and Technical Reports. The full texts of these recommendations and reports are published in *PAC*.

Characteristics of liquid stationary phases and column evaluation for gas chromatography

The choice of an appropriate stationary phase is one of the most important decisions to be made in developing a gas chromatographic method. Provided the support is reasonably inert and well covered its exact nature is not critical apart from its contribution to flow characteristics and hence to resolution. The following topics are discussed: (i) Basic characteristics of liquids for stationary phases; (ii) Definitions of column performance. Resolution equations. Trennzahl value. The Separation Factor; (iii) Selection of a liquid stationary phase for a particular separation, (a) empirical approach, (b) use of Rohrschneider and of McReynolds constants; (iv) Test mixtures; (v) Patterns of column selectivity behaviour; (vi) Sources for the chemical composition of liquid stationary phases; (vii) Conclusions.

This report was prepared by the Commission on Analytical Reactions and Reagents (V.1) and was published in PAC, Vol. 58, No. 9, pp. 1291–1306 (1986).

Determination of manganese in biological materials

Although the essential nature of manganese in humans has yet to be firmly established, it is clearly an important constituent of a number of enzyme systems, and is clearly implicated in a number of deficiency conditions in animals. The accurate determination of manganese in biological materials is therefore of considerable importance for both metabolic and toxicological studies in humans and animals. Much of the earlier literature on manganese determinations, in particular in serum and urine, is marred by errors in the analytical procedures due principally to a failure by analytical chemists to fully appreciate the requirements for stringent control of contamination during sampling and sample handling prior to analysis. The wider availability of electrothermal atomic absorption instruments, particularly those incorporating the most recent advances in technology has brought the determination of manganese in serum and urine within the scope of

many routine hospital laboratories. The application of this technique, coupled with the availability of centres providing activation analysis as a reference method, could have a significant impact on our knowledge of the biochemical functions of manganese in the next ten years.

This report was prepared by the Commission on Microchemical Techniques and Trace Analysis (V.2) and was published in PAC, Vol. 58, No. 9, pp. 1307–1316 (1986).

PAC Review

New generation of pesticides

The word 'pesticides' is a broad term which covers insecticides, herbicides, fungicides, rodenticides, miticides, algicides and nematocides. The term pesticides also applies to compounds used as repellants, attractants and insects sterilants or chemosterilants.

Pesticides may be regarded as 'economic poisons' and are defined as "any substance used for controlling, preventing, destroying, repelling or mitigating any pests". Some pesticides do not actually kill pests. They fit into the broader umbrella of pesticides in a practical sense. Among these are chemical compounds that stimulate or retard growth of plants, compounds that remove leaves and defoliant.

A new generation of pesticides is now evolving based on a knowledge of metabolic pathways. A paper by R. A. Kulkarni (Bombay, India) presented at the First International Symposium on Organic Chemistry in Technological Perspective held in Jerusalem, Israel, 1–6 June 1986 reviews the effectiveness of several classes of natural pest control agents such as: pheromones, allelopathic chemicals, toxicants from tropical and desert plants, naturally occurring hormonal agents from insects and plants, microbial agents, plant growth regulators, and natural products such as inducers of insect resistance. Kulkarni's paper and other invited lectures are published in *PAC*, Vol. 58, No. 6 (1986). Also published in this issue is a paper entitled "C₁ Chemistry: potential and developments" by Wilhelm Keim (Aachen, FRG). C₁ chemistry based on synthesis gas, methane and carbon dioxide offers many routes to industrial chemicals. Synthesis gas chemistry can be divided into a direct and indirect approach. The present economic climate favours direct routes of CO hydrogenation which retain at least one of the oxygen atoms of the original CO reactant. Potential applications exist for alcohols, acids, anhydrides and esters. Methanol can be considered to be a potential building block representing the indirect

Electrochemical studies of non-aqueous solutions

Electrochemistry is a classical field, but it is currently developing rapidly owing largely to improvements in electronics and the introduction of new materials having electronic or ionic conductivity. In some of these developments, non-aqueous solvents are used as a matter of necessity, for example, in lithium batteries. On the other hand, many interesting developments so far have been limited to aqueous solutions even though no fundamental reasons exist why extension to non-aqueous solutions should not be feasible. In this respect current developments follow the historical pattern of the field of electrochemistry in that applications to non-aqueous media generally lag far behind those involving aqueous solutions. Reasons undoubtedly include experimental difficulties encountered in the more interesting non-aqueous solvents and the complexity of ion-ion and ion-solvent interactions in such solvents, particularly those that have weak solvating abilities and/or low permittivities.

Current trends in electrochemical studies of non-aqueous solutions were discussed by J. F. Coetzee (Pennsylvania, USA) in a paper presented at the 10th International Conference on Non-aqueous Solutions held in Leuven, Belgium, 17–21 August 1986. Coetzee placed emphasis on experimental approaches judged to be particularly promising for the future development of both fundamental and applied aspects of the field of solution chemistry. Topics included recent developments in the application of potentiometric sensors to non-aqueous solutions, the potential of such new material as reactively sputtered iridium oxide as hydrogen ion sensors, and the dem-

onstrated or potential advantages of micro-electrodes with diameters less than approximately 20 μm in cyclic voltammetry and a variety of other electrochemical techniques applicable to non-aqueous solutions. Coetzee also placed emphasis on the extension of electrochemical measurements to non-polar media. Finally, he discussed briefly recent developments in certain other areas such as applications of solid electrolytes and chemically modified electrodes, and studies of interfaces between immiscible solvents.

Coetzee's lecture and other plenary and section lectures presented at the Leuven conference are published in *PAC*, Vol. 58, No. 8 (1986).

conversion route. Based on methanol, the synthesis of a variety of chemicals such as acetic acid, ethanol, ethylene glycol, acetaldehyde and many more is feasible. The second part of this paper deals with applications of methane in C_1 chemistry. Principally, two approaches are feasible: methane as feedstock for synthesis gas/methanol and coupling of methane to C_n products. In the last part of his paper Keim discusses potential reactions for using CO_2 as building block for chemicals.

In another paper, published in the June issue of *PAC*, James D. Navratil (Golden, USA) reviews some aspects of solvent extraction in nuclear technology. He summarizes applications of solvent extraction in actinide recovery and purification, radionuclide production, and reactor materials preparation. The need for new, more selective, solvent extraction reagents is presented by means of examples of recent work with bifunctional organophosphorus reagents applied to the removal of actinides from acidic radioactive waste solutions.

Newsletters & Bulletins

International Council of Scientific Unions (ICSU)

ICSU Committee on Data for Science and Technology (CODATA)

CODATA Newsletter, No. 34, October 1985. This issue contains an announcement of the publications plans and needs of CODATA's Thermodynamic Tables Task Group. **No. 35, January 1986** also has details of the work of this Task Group. There is also information about the work of the CODATA Referral Database Task Group. **No. 36, April 1986** contains the programme of the 10th International CODATA Conference which was held in Ottawa, 14–17 July 1986.

ICSU Committee on Space Research (COSPAR)

COSPAR Information Bulletin, No. 105, April 1986. This contains a report of an international workshop on satellite-derived sea surface temperatures (SST). Present SST accuracies achieved by infrared and microwave sensors represent major technological achievements. However, many important SST data from space have been contaminated by atmospheric aerosols and undoubtedly more will be so contaminated. A correction scheme has been developed that drastically reduces this problem.

There is also a report on the first observations from space of Halley's Comet obtained by the *International Ultraviolet Explorer* spacecraft (IUE). The characteristic emissions of the elements hydrogen, carbon, oxygen and sulphur as well as the emissions of molecules such as carbon disulphide and water were identified.

International Astronomical Union (IAU)

IAU Information Bulletin, 55, December 1986. This gives an outline of IAU over the years and a report on the XIXth General Assembly held in Delhi, India, November 1985. There are also reports on IAU Executive Committee meetings and the work of the Commissions and also IAU sponsored symposia and colloquia.

European Photochemistry Association (EPA)

EPA Newsletter, No. 26, March 1986. This issue contains an article on one of the pioneers of photochemistry, Alexander Schonberg (1892–1985). There is also an article on photochemistry in Portugal and the "Glossary of Terms Used in Photochemistry" prepared by the IUPAC Commission on Photochemistry (III.3) — see also *CI*, No. 2, p. 18 (1986).

IUPAC Committee on the Teaching of Chemistry (CTC)

International Newsletter on Chemical Education, No. 24, December 1985. This issue is concerned principally with reports on the 8th International Conference on Chemical Education which was held in Tokyo, Japan, 23–28 August 1985. It includes papers on chemical education in the computer age (Lawrence H. L. Chia, Singapore); chemical education for fostering future chemists of excellence (A. R. H. Cole, Western Australia); chemical education for life sciences (Jens Josephsen, Denmark); chemical education and industry (S. Kirschner, USA) and closer ties seen between chemical education and industry in developing countries — a move in the right direction (Patrick Tam, Hong Kong).

International Association on Water Pollution Research and Control (IAWPRC)

IAWPRC Newsletter, No. 1, 1986. This contains an item on the battle against onchocerciasis (river blindness), a disease transmitted by blackfly. There is also an article entitled "Getting Mediterranean Pollution Under Control" based on IAWPRC's conference held in Split, Yugoslavia, 2–5 October, 1985.

International Federation of Clinical Chemistry (IFCC)

IFCC News, No. 41, 1986/1. This contains details of the Mexico Clinical Chemistry Project and a headline article entitled "Quantities and Units Update". The issue includes proposals for nomenclature of derived units prepared for the IFCC Expert panel of Quantities and Units (EPQU) and the IUPAC Commission on Quantities and Units (VII.2) by J. C. Rigg, B. F. Visser and H. P. Lehmann.

Groupe pour l'Avancement des Méthodes Spectroscopiques et Physico-Chimiques d'Analyse (GAMS)

GAMS — Information Bulletin No. 95, March–April 1986. More news (in French) of GAMS activities, meetings and publications.



International Organization for Standardization (ISO)

ISO Bulletin, No. 3, March 1986. This issue is largely devoted to ISO standards for storage of fruit and vegetables. **No. 4, April 1986** looks at objectives of international packaging standardization. ISO is in the course of extending its series of International Standards relating to the petroleum industry to include agreement on details which respond ultimately to the demands of accuracy in delivery as regards quantity. This issue contains a report on this entitled "Getting the Measure of Black Gold". **No. 5, May 1986** outlines ISO activities relating to steel including methods of determining chemical composition, mechanical and physical tests and the need for terminology. **No. 6, June 1986** is mainly about colour. A new ISO technical committee ISO/TC 187, *Colour notation* held its first meeting in September. It is believed that the several existing systems of notation may bear a simple relationship to each other and allow an approach to an international system. An article with the title "Beyond the Rainbow" describes the background to this endeavour in terms of the problems faced in calibrating colour perception.

European Federation of Biotechnology (EFB)

EFB Newsletter, 27.3.1986 contains two items on the activities of the EFB Working Party on Applied Molecular Genetics. It also contains a report of the EFB General Assembly held at Baden, near Vienna, Austria, 30 September 1985.

Environment Liaison Centre (ELC)

Ecoforum, No. 1, February 1986 contains a major article on "Revolving Loan Funds — Some Practical Ideas for Women's Groups" and another on "Aid, Trade and Hunger".

Ecoforum: News Alert, No. 1, February 1986 has a report on the SATIS (Socially Appropriate Technology International Information Services) General Assembly held in New Delhi, December 1985.

Biological Investigations of Marine Antarctic Systems and Stocks (BIOMASS)

BIOMASS Newsletter, No. 2, December 1985. BIOMASS is a major international programme of the Antarctic marine ecosystem and its living resources, sponsored by the ICSU Scientific Committees on antarctic Research and on Oceanic Research (SCAR and SCOR respectively), the International Association for Biological Oceanography (IABO) and the UN Food and Agricultural Organization (FAO) Advisory Committee on Marine Resources Research (ACMRR). This Newsletter con-

tains information on the Argentine Oceanographic Data Centre; the First Symposium on Antarctic Fish held in Stockholm, Sweden during the Fifth European Ichthyological Congress, 12–16 August 1986 and Indian Expeditions to Antarctica.

Sentinel: Health and Environmental International, Vol. 2, No. 3, March 1986. Articles and news items on pollution monitoring of air and water quality; control of chemicals in the WHO European Region and co-operation in environmental science.

United National Environmental Programme (UNEP)

Industry and Environment, Vol. 8, No. 3, July/August/September 1985. This issue contains articles on avenues for the safe handling of plant protection agents; the use of pesticides in the cultivation of cotton in Central America; safety aspects of electrodynamic spraying; the impact of agrochemicals on human health and the environment; pesticide safety programmes geared to needs of developing countries; care for the environment when formulating pesticides and domestic and international pesticide policies in the United States. **Vol. 9, No. 1, January/February/March** is mainly about tourism and its impact on the environment and on the way of life of the host population. There is also a small item on dinitrotoluenes (DNT) and their mutagenic, carcinogenic, and adverse reproductive effects on animals.

Conferences

Federation of European Chemical Societies (FECS) General Assembly

Some nineteen member Societies from sixteen countries were represented at the 17th General Assembly of FECS in Plovdiv, Bulgaria, 19–20 June 1986: the Federation currently totals 32 societies from 25 countries.

Elections took place to form the new eight-person Council, which has replaced and rationalized the work of the previous Advisory Board and Executive Committee. The following were elected, for a three-year term in the first instance: Prof. I. Dilaris (Greece), Dr J. S. Gow (UK), Prof. B. Hajek (Czechoslovakia), Prof. G. Jommi (Italy), Prof. J. L. Rivail (France), Prof. N. Schamp (Belgium), Prof. B.

Stanovnik (Yugoslavia), and Prof. V. Zubov (USSR). Prof. Jommi will chair the Council, Prof. Zubov having completed his term of office at Plovdiv. The Joint Secretaries, Dr W. Fritzsche (FRG) and Dr A. Jakobos (Hungary), continue the remaining two years of their present three-year term, but Dr Fritzsche gave notice that he will not offer himself for re-election as he will retire from Gesellschaft Deutscher Chemiker in five years' time.

The Annual Report for 1985 summarized the activities of seven Working Parties and a Discussion Group on Chemistry for Developing Countries: the latter will meet in autumn 1986 to coordinate and intensify its work. The Working Party on Professional Affairs has finalized an



Prof. Zubov (left) and Prof. Jommi, retiring and incoming Chairmen of FECS.

interface paper on 'Chemists and Other Professionals', which is not intended for wide publication now, but to serve as a working document in member countries — new areas of study include Chemists and Computer Professionals, Chemists and Analysis, Chemistry and Links to Higher Education. A fourth edition of the booklet detailing 'Organometallic Research Centres in Europe' was completed by the Working Party on Organometallic Chemistry and is now available. The chief activity of the Working Party on Chemistry and the Environment is preparations for the 3rd European Conference on this subject, provisionally entitled 'Risk Assessment of Environmental Chemicals' and scheduled to be hosted at Guildford, UK, by the Royal Society of Chemistry during 12–15 July 1988. The Working Party for the History of Chemistry supports a proposal that UNESCO should declare 1989 as 'The Year of Chemistry': 1789 is recognized as the birth-year of modern chemistry through publication of books by Kirwan, Lavoisier, and Richter. The Working Party on Analytical Chemistry reported that arrangements are well advanced for Euroanalysis-VI in Paris during 7–11 September 1987. Promotion of the science continues by the Working Party on Food Chemistry with the biennial organization of European Symposia on food analysis and food chemistry and of interdisciplinary symposia jointly with other scientific societies on food toxicology and food packaging; some harmonization of analytical methods is currently being prepared jointly with the British, Dutch and German Authorities via a system of Euro Colabs on Food Analysis.

Discussion Groups are preparing possible activity programmes for the creation of two new Working Parties, namely on Electrochemistry and on Interfacial Phenomena. Ways were discussed at Plovdiv with the IUPAC representative, Dr M. Williams, of improving collaboration between the Working Parties of the Federation and the

corresponding bodies of the Union, of which FECS is an Associated Organization. Dr Williams also gave details regarding forthcoming CHEMRAWN Conferences and of a recent IUPAC initiative on Chemical Safety, together with statistics regarding the launch of the IUPAC Affiliate Membership Scheme at the start of 1986. The target of 5000 Affiliates in the first year had already been exceeded at the half-way stage, and help was promised at Plovdiv to recruit Affiliates in Greece, Italy, Yugoslavia and Zaire.

A joint meeting of FACS (the corresponding Asian Federation) and FECS — The EURASIA conference — is being planned for February 1988 in Baghdad, Iraq. The next meeting of Presidents of Chemical Societies is scheduled for Boston, USA, preferably with a complete one-day separation from the IUPAC Council Meeting ending on 29 August 1987.

The following statement was officially adopted by FECS for consideration of immediate publication by all member societies in their countries:

"The 17th General Assembly of the Federation of European Chemical Societies in regard to accidents such as in the Chernobyl Nuclear Power Station is especially concerned by the lack of clear, consistent information from various governments and the reactions by some mass media, which caused unnecessary panic among the general public.

Therefore, the Federation emphasizes that scientists of all disciplines should cooperate in order to improve the reliability of the Nuclear Power Stations to eliminate any accidents that would endanger the health and lives of the people, and also establish closer relations with the governmental agencies and the mass media through their scientific and technical societies so that accurate and timely information is made available. Where appropriate, the Chemical Societies are anxious to provide their collective expertise to help in this work."

M. Williams



Two participants at the FECS General Assembly: Dr R. Darms (Swiss Committee of Chemistry) and Mrs A. Vasmavuori (Association of Finnish Chemical Societies).

Water for Mankind in the Year 2000

An international symposium entitled 'Water for Mankind in the Year 2000' organized by the Universal Movement for Scientific Responsibility (UMRS) in cooperation with UNESCO will be held in the Meridian Hotel, Cairo, Egypt, 16–20 November 1986. Scientific topics will cover:

- Water and health: pathological, parasitical risks and pollution
- Water and agriculture: conditions and consequences of agricultural water use
- Water and environment: ecology and way of life

- Water and urban concentrations: the megapoles of the next future.

The working languages of the symposium will be English and French. Simultaneous translation will be provided. Further details and registration forms are available from UMRS Secretariat, 127, Boulevard Saint Michel, 75005 Paris, France.

Euroanalysis

This conference, which will be held in Paris, France, 7–11 September 1987, will cover all aspects of Analytical Sciences. The deadline for submitting papers is 15 November 1986. Contact: G.A.M.S. 88, Boulevard Malesherbes, 75008 Paris, France.

IUPAC-Sponsored Conferences

2nd International Symposium on Quantitative Luminescence Spectrometry in Biomedical Sciences *Ghent, Belgium, 11–14 May 1987*

This symposium will be held at the State University of Ghent (Rijksuniversiteit Ghent). The scientific programme includes the following plenary lectures:

- Use of luminescence techniques for sensitive and selective determinations in HPLC (U. A. Th. Brinkman, The Netherlands)
- Biomedical applications of luminescence in micellar and cyclo dextrin media (L. J. Cline Love, USA)
- Thermochemiluminescence techniques (J. C. Hummelen, Netherlands)
- Enhanced chemiluminescence enzyme immunoassays (L. J. Kricka, UK)
- Fluorescence techniques in chemical and biomedical analysis (S. G. Schulman, USA)
- Fibre optical sensors in biomedical sciences (O. S. Wolfbeis, Austria)

Contributed papers (20 minute lectures and poster communications) will cover the following topics: drug and bioanalysis via fluorescence and phosphorescence (LTP, RTP, micellar); fluorescence and chemiluminescence immunoassays; detection techniques in chromatography (fluorescence, RTPL); thermochemiluminescence techniques; solid surface luminescence methods; chemical derivation methods; use of fluorescence labels; luminescence applications and drug metabolism, clinical chemistry, biochemistry, pharmacokinetics, toxicology, ecology, protein tagging.

The symposium will be conducted in English.

Registration fees are (6 000 BF or US-\$120 before April 6, 1987 or 7 000 BF or US-\$140 after April 6,



1987). The fee entitles the registrant to participate both at the scientific sessions and the social programme (except the boat trip with dinner: 1 700 BF or US-\$34), a copy of the final programme, an abstracts volume, a copy of the special issue of

Analytica Chimica Acta, Elsevier (to be mailed after the symposium) and refreshments during the breaks. Affiliates are entitled to 10 per cent reduction of registration fee.

Accommodation is available in local hotels at rates ranging from 1 600 BF to 3 000 BF.

Belgium has nine provinces, each having its own provincial capital. The principal cities, comprising a

quarter of the whole population, are: Brussels (the capital), Antwerp (a port) and Ghent. Dutch, French and German are all spoken in this country. In addition, English is also spoken by many people. The average Fleming is bilingual and many are multilingual; staff members and a considerable number of the students of the University of Ghent speak Dutch, French and English.

International Symposium on Free Radical Polymerization Kinetics and Mechanisms

Genoa, Italy, 17–22 May 1987

This symposium is sponsored by both IUPAC and the European Polymer Federation (EPF) and organized by CNR Center on Macromolecules and Institute of Industrial Chemistry of the University of Genoa. It will be held in Santa Margherita Ligure (SML) near Genoa at the Hotel Regina Elena.

The symposium will deal with the fundamental aspects of free-radical polymerization, re-examined in terms of classical and modern theories and approaches. The various models proposed to describe kinetics and mechanisms will be critically compared, on the basis of their adequacy to attain chemical and physical comprehensiveness. The symposium will include the following topics:

- Overall polymerization scheme: chemistry, kinetics and thermodynamics
- Initiation and inhibition
- Termination
- Propagation and radical reactivity
- Chain transfer and molecular mass distribution
- Copolymer composition
- Copolymerization rate
- Non-homogeneous polymerization

• Reaction engineering

The scientific programme will also include posters on the above topics and covering specific aspects of both basic and applied research in the field.

The registration fees, to be paid before 31 January 1987, are as follows:

IUPAC Affiliate, EPF Member	270 000 Lire
Active participant	300 000 Lire
Accompanying person	100 000 Lire
Student	150 000 Lire

After that date an extra charge of 50 000 Lire will be requested. The symposium will be limited to 180 participants.

Accommodation is available at Hotel Regina Elena, and other hotels and pensions are within walking distance of the hotel.

SML is a small town, enchantingly situated in a recess of the Tigullio Gulf the full glory of the sun, undisturbed by the winds. It is the only access to the world famous promontory of Portofino.

Conference Calendar

Conference circulars and registration forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in parentheses.

1986

Natural Toxicants; Mutagenicity of Food

15–17 October. Interdisciplinary Conference (EURO FOOD TOX II). Zürich, Switzerland.
(Dr R. Battaglia, Kent Laboratory, Postfach, CH-8030 Zürich, Switzerland.)

Environmental Characterization

10–12 November. International Symposium on New Sensors and Methods for Environmental Characterization. Kyoto, Japan.
(International Symposium SMEC, c/o Institute for Chemical Research, Kyoto University, Uji, Kyoto 611, Japan.)

1987

Porous Solids

27–29 April. International Symposium on Characterization of Porous Solids. Bad Soden, Nr. Frankfurt, FRG.
(Prof. K. K. Unger, Institut für Anorganische Chemie und Analytische Chemie, Johannes Gutenberg-Universität, Joh.-Becher-Weg 24, D-6500 Mainz, Federal Republic of Germany.)

Quantitative Luminescence Spectrometry

11–14 May. 2nd International Symposium on Quantitative Luminescence Spectrometry in Biomedical Sciences. Ghent, Belgium.

(Dr Willy R. G. Baeyens, Laboratory of Pharmaceutical Chemistry and Drug Quality Control, Faculty of Pharmaceutical Sciences, State University of Ghent, Harelbekestraat 72, B-9000 Ghent, Belgium.)

CHEMRAWN VI

17–22 May. CHEMRAWN VI. World Conference on Advanced Materials Needed for Innovations — Energy, Transportation and Communications. Tokyo, Japan. (CHEMRAWN VI Coordinating Office, The Chemical Society of Japan, 1-5 Kanda-Surugadai, Chiyoda-ku, Tokyo 101, Japan.)

Free-Radical Polymerization

17–23 May. International Symposium on Free-Radical Polymerization: Kinetics and Mechanisms. Santa Margherita Ligure, Nr. Genoa, Italy. (Prof. Savegrio Russo, C.N.R. Center on Macromolecules, Corso Europa 30, I-16132 Genoa, Italy.)

Organosilicon Chemistry

7–12 June. 8th International Symposium on Organosilicon Chemistry. St. Louis, Missouri, USA. (Prof. Peter P. Gaspar, Department of Chemistry, Washington University, St Louis, Missouri 63130, USA.)

Pollutants in Porous Media

14–19 June. 2nd International Workshop on Behaviour of Pollutants in Porous Media. Bet Dagan, Israel. (Dr Zev Cerstl, Institute of Soils and Water, Volcani Center, ARO, PO Box 6, Bet Dagan 50-520, Israel.)

Boron Chemistry

22–26 June. 6th International Conference on Boron Chemistry. Bechyne, Nr. Tabor,

Czechoslovakia. (Dr Bohumil Stibr, Institute of Inorganic Chemistry, Czechoslovak Academy of Sciences, CS-250 68 Rez near Prague, Czechoslovakia.)

Macromolecules

30 June–4 July. 31st International Symposium on Macromolecules. Merseburg, GDR. (Technische Hochschule “Carl Schorlemmer”, Leuna-Merseburg, Macro 87, Otto-Nuschke-Strasse, DDR-4200 Merseburg, German Democratic Republic.)

Macromolecules

6–9 July. 30th Microsymposium on Macromolecules. Polymer-Supported Organic Reagents and Catalysts. Prague, Czechoslovakia. (Dr P. Čefelín, Scientific Secretary, P.M.M. Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovského náměstí 2, CS-16206 Prague 6-Petriny, Czechoslovakia.)

Bioinorganic Chemistry

6–10 July. 3rd International Conference on Bioinorganic Chemistry. Noordwijkerhout, The Netherlands. (Prof. J. Reedijk, State University Leiden, Gorleaus Laboratories, PO Box 9502, NL-2300 RA Leiden, The Netherlands.)

Macromolecules

13–16 July. 10th Discussion Conference on Macromolecules. Small-angle Scattering and Related Methods. (Dr P. Čefelín, Scientific Secretary, P.M.M. Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovského náměstí 2, CS-16206 Prague 6-Petriny, Czechoslovakia.)

IUPAC Congress

13–18 July. 31st International Congress of Pure and Applied Chemistry. Sofia, Bulgaria. (Secretariat, 31st IUPAC Congress, c/o Dr R. Vlahov, Institute of Organic Chemistry, Bulgarian

Academy for Sciences, 1113 Sofia, Bulgaria.)

Heteroatom Chemistry

19–24 July. International Conference on Heteroatom Chemistry (ICHAC-1987). Kobe, Japan. (Prof. Michio Kobayashi, Secretary, ICHAC-1987, c/o Kinki Chemical Society, 1-8-4, Utsubo-Honmachi, Nishiku, Osaka 550, Japan.)

Organometallic Chemistry

26–30 July. 4th International Symposium on Organometallic Chemistry Directed Towards Organic Synthesis (OMCOS IV). Vancouver, B.C., Canada. (Prof. Michael D. Fryzuk, Department of Chemistry, The University of British Columbia, 2036 Main Hall, Vancouver, British Columbia, Canada V6T 1Y6.)

Chemical Education

26–31 July. 9th International Conference on Chemical Education. Sub-title: ‘Chemistry for our New World’. São Paulo, Brazil. (Prof. Ernesto Giesbrecht, Instituto de Quimica, Universidade de São Paulo, Caixa Postal 20.780, 01498-São Paulo, SP, Brazil.)

Coordination Chemistry

26–31 July. 25th International Conference on Coordination Chemistry. Nanjing, China. (Prof. Xiao-Zeng You, Conference Secretary, XXV ICC, Coordination Chemistry Institute, Nanjing University, Nanjing, Jiansu Province, China.)

Solute–Solute–Solvent Interactions

9–14 August. 8th International Conference on Solute–Solute–Solvent Interactions. Regensburg, Federal Republic of Germany. (Prof. J. M. G. Barthel, Institut für Physikalische und Theoretische Chemie, Universität Regensburg, Universitätstrasse 31, D-8400 Regensburg, Federal Republic of Germany.)

Theoretical Organic Chemistry

11–21 August. World Congress of Theoretical Organic Chemists. Budapest, Hungary.
(Dr I. G. Csizmadia, Department of Chemistry, University of Toronto, Toronto, Ontario, Canada M5S 1A1.)

Trace Elements

17–21 August. 2nd Nordic Symposium on Trace Elements in Human Health and Disease. Odense, Denmark.
(Prof. Philippe Grandjean, Department of Environmental Medicine, Institute of Community Health, Odense University, J. B. Winslows Vej 19, DK-5000 Odense C, Denmark.)

Fourier Transform Spectroscopy

24–28 August. 6th International Conference on Fourier Transform Spectroscopy. Vienna, Austria.
(6th FTS Conference 1987, c/o Interconvention, PO Box 80, A-1107 Vienna, Austria.)

Cationic Polymerization

24–28 August. 8th International Symposium on Cationic Polymerization and Related Processes. Munich, FRG.
(Prof. Oskar Nuyken, Institut für Organische Chemie, Johannes Gutenberg-Universität Mainz, Postfach 3980, J. J. Becher-Weg 18-20, D-6500 Mainz, Federal Republic of Germany).

Plasma Chemistry

31 August–4 September. 8th International Symposium on Plasma Chemistry. Tokyo, Japan.
(Prof. Kazuo Akashi, Dept. of Metallurgy & Materials Science, Faculty of Engineering, The University of Tokyo, 7-3-1, Hongo, Bunkyo-ku, Tokyo 113, Japan.)

CHEMRAWN IV

21–25 September. "Modern Chemistry and Chemical Technology Applied to the Ocean and its Resources". Woods Hole, Massachusetts, USA.
(Dr Derek W. Spencer, Associate

Reduced conferences fees for Affiliates

Organizers of the following conferences have agreed to a 10 per cent reduction in Conference fees for Affiliates:

- International Symposium on New Sensors and Methods for Environmental Characterization (SMEC) (Kyoto, Japan, 10–12 November 1986)
- 2nd International Symposium on Quantitative Luminescence Spectroscopy in Biomedical Sciences (Ghent, Belgium, 11–14 May 1987)
- International Symposium on Free-Radical Polymerization: Kinetics and Mechanism (Genoa, Italy, 17–23 May 1987)
- 31st International Symposium on Macromolecules (Merseburg, GDR, 30 June–4 July 1987)
- International Conference on Heteroatom Chemistry (ICHAC-1987) (Kobe, Japan, 19–24 July 1987)
- 8th International Symposium on Solute–Solute–Solvent Interactions (Regensburg, FRG, 9–14 August 1987)

Director for Research, Woods Hole Oceanographic Institution, Woods Hole, MA 02543, USA).

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Natural Products

29 May–4 June. 16th International Symposium on the Chemistry of Natural Products. Kyoto, Japan.
(Prof. Sho Itô, Department of Chemistry, Faculty of Science, Tohoku University, Aramaki-aza-Aoba, Sendai 980, Japan.)

Organic Synthesis

4–7 July. 7th International Conference on Organic Synthesis. Nancy, France.
(Prof. P. Caubere, Laboratoire de Chimie Organique 1, Faculté des Sciences, Université de Nancy 1, BP 239, F-54506 Vandoeuvre-les-Nancy Cédex, France.)

Macromolecules

1–6 August. 32nd International Symposium on Macromolecules. Kyoto, Japan.
(Prof. Takeo Saegusa, Department of Synthetic Chemistry, Faculty of Engineering, Kyoto University, Yoshida-machi, Sakyo-ku, Kyoto, 606 Japan.)

Mycotoxins and Phycotoxins

16–19 August. 7th International Symposium on Mycotoxins and Phycotoxins. Tokyo, Japan.
(Prof. Shinsaku Natori, Maiji College of Pharmacy, 1-22-1, Yatocho, Tanashi-shi, Tokyo 188, Japan.)

1990

Organic Synthesis

June. 8th International Conference on Organic Synthesis. Helsinki, Finland.
(Prof. Tapio Hase, Department of Chemistry, University of Helsinki, Vuorikatu 20, SF-00100 Helsinki, Finland.)

Pesticide Chemistry

5–11 August. 7th International Congress of Pesticide Chemistry. Hamburg, FRG.
(Dr W. Fritsche, Gesellschaft Deutscher Chemiker, Carl Bosch Haus, Postfach 900440, Varrentrappstrasse 40–42, D-6000 Frankfurt/Main 90, Federal Republic of Germany.)



ORGANIC SYNTHESIS: AN INTERDISCIPLINARY CHALLENGE

Edited by

Jacques Streith *University of Mulhouse, France,*
Horst Prinzbach and **Gottfried Schill**, *both of the*
University of Freiburg, Freiburg i. Br., Federal
Republic of Germany

The worldwide attempts of synthetic organic chemists to open up new territories and to reclaim the long neglected ones were highlighted at the 5th IUPAC International Symposium on Organic Synthesis held in Freiburg i. Br. (FRG) on 27-30 August 1984. To pursue the increasingly interdisciplinary goals and activities, the Symposium Organizing Committee stressed emphasis on the following four main themes:

- **Modern Methodology in Organic Synthesis**
- **Transition Metals in Organic Synthesis**
- **Enzymatic Processes in Organic Synthesis**
- **Carbohydrates in Organic Synthesis**

Twenty-nine plenary lectures covering these themes presented by the following distinguished organic chemists are included in the book originating from the Symposium.

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L.S. Hegedus (USA)	G. Quinkert (FRG)	R.J. Ferrier
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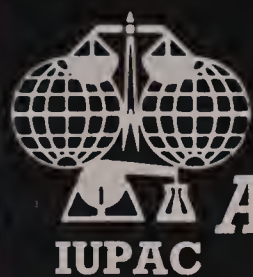
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Enthalpies of Vaporization of Organic Compounds

A Critical Review and Data Compilation

Chemical Data Series No. 32

V. Majer and V. Svoboda *Dept of Physical Chemistry, Institute of Chemical Technology, Prague, Czechoslovakia*

This databook results from a project of the IUPAC Subcommittee on Thermodynamic Tables coordinated by **H.V. Kehiaian**. The purpose of the project was to collect and critically evaluate all calorimetrically determined data on the enthalpy of vaporization ΔH_V of organic compounds, to generate a set of recommended values, and to evaluate standard enthalpies of vaporization and cohesive energies. Every effort was made to furnish maximum amount of information on the origin of experimental data, their reliability and consistency, experimental techniques and the data treatment. Besides the recommended values with accuracy estimates, the tables list all the direct experimental values with relevant comments. Main applications of enthalpies of vaporization in thermodynamics and chemical engineering are discussed and also included is a survey of calorimetric techniques which have been used to determine ΔH_V .

The data compilation includes the following

- It presents all available enthalpy of vaporization data determined by calorimetric means since 1932.
- The recommended values of ΔH_V are listed for 298.15 K and the normal boiling temperature. The temperature dependence of the enthalpies of vaporization described in terms of correlating equations and the parameters are tabulated.
- Based on the recommended values for ΔH_V , calculated values are listed for the standard enthalpies of vaporization at 298.15 K, and for the cohesive energies at 298.15 K and the normal boiling temperature. Also included are the parameters describing the temperature dependence of the cohesive energies.

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Journal of the American Chemical Society

Volume 25

METALS IN MERCURY

Editors: C HIRAYAMA, *Westinghouse Corporation, Pittsburgh, PA, USA*, Z GALUS, *University of Warsaw, Poland*, and C GUMINSKI, *University of Warsaw, Poland*

This volume covers binary amalgams of all the metals, together with those of carbon, silicon and boron, a total of 76 systems. Complete literature coverage extends through 1983. The emphasis is on accurate, evaluated solubility data, but phase diagrams have been included where they have been defined, and will aid the reader in assigning the solid-liquid equilibrium. The data have been critically evaluated, and are classified as 'recommended' when independent determinations agree within experimental error. The data may also be used to compute thermodynamic properties of the binary components. Of interest to metallurgists (particularly those using amalgam extractive metallurgy), electrochemists and analytical chemists (particularly users of amalgam electrodes), and physical and inorganic chemists.

Contents: Foreword. Preface. Introduction: the solubility of solids in liquids. Compilations and critical evaluations of reported solubility data for 76 binary systems with mercury as one component, the other component being a metal, carbon, silicon or boron (arranged according to the periodic table, and including the lanthanides and actinides). System index. Registry number index. Author index.

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Volume 26

SULFITES, SELENITES & TELLURITES

Editors: M R MASSON, *University of Aberdeen, Aberdeen, UK*, H D LUTZ, *University of Siegen, Siegen, FRG*, and B ENGELEN, *University of Siegen, Siegen, FRG*

This volume presents compilations and critical evaluations of reported solubility data for a wide range of compounds, including binary, ternary and more complex systems. The entire literature up to 1984 has been covered. Rigorous statistical procedures have been applied in the evaluations. For many of the ternary systems and some quaternary ones, computer-drawn phase diagrams are included (prepared to the same scale where possible to allow easy comparison). Of interest to physical, inorganic and analytical chemists, and those working in paper manufacture, fertilizer formulation and sugar refining.

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The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary, non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.

Its objectives are:

- to promote continuing co-operation among the chemists of the member countries;
- to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
- to co-operate with other international organizations which deal with topics of a chemical nature;
- to contribute to the advancement of pure and applied chemistry in all its aspects.

The membership of IUPAC presently comprises 42 countries, each represented by a national organization, such as an academy of science or research council.

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Chemistry International



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Chemistry International

The news magazine of the International Union
of Pure and Applied Chemistry (IUPAC)



1986, Vol 8, No 6 (December)

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The news magazine of the International Union of Pure and Applied Chemistry (IUPAC)

EDITOR: Michael Freemantle

PRODUCTION EDITOR: Latha Menon

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Six issues of *Chemistry International* will be published in 1986. The 1986 subscription rate including postage is £26 (UK), £31 (overseas), US \$40 (USA and Canada). The individual subscription rate is US\$20. Microfiche subscriptions are available simultaneously with the printed edition, and microfilm at the end of the subscription year. Subscription orders may be placed directly with IUPAC's official publisher, Blackwell Scientific Publications Ltd, PO Box 88, Oxford, England.

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The news magazine is delivered to North America by accelerated surface post and subscribers there can expect to receive their copies within two weeks of British publication. Current issues for the Indian Sub-Continent, Australasia and the Far East are sent by air to regional distribution points from where they are forwarded to subscribers by surface mail. Any back numbers are normally despatched by surface to all regions, except North America where they are sent by a.s.p., and India, where they are sent by air freight.

Reproduction of Articles

Reproduction or translation of articles in this issue is encouraged, provided that it is accompanied by a reference to the original publication in *Chemistry International*, unless there is a footnote to the contrary.

Front cover: The central market in San Salvador, El Salvador. Mycotoxins have a pronounced impact on the quality of food produced throughout the world – see article on p. 9. (*Photo: UNESCO/Dominique Roger.*)

New developments in scientific databases presented at CODATA conference

The 10th International CODATA Conference and 15th General Assembly, held in Ottawa, Canada, 14–19 July this year, brought together 300 experts in the evaluation and dissemination of numerical databases in all fields of science and technology. The central theme of the conference, "Computer Handling and Dissemination of Data" was brought out in sessions devoted to data validation by statistical techniques, general approaches to database design, and options for computer-based dissemination of data to the scientific community. Specialized sessions reviewed the state of the art in data management in fields such as materials properties, molecular biology, geophysics and mapping, and thermodynamics. Demonstrations were offered of over 20 numerical or factual databases covering various topics in chemistry, physics, biology, and the geosciences.

Highlights of the developments presented at the conference included:

- Demonstration of on-line retrieval of data on hybridomas and monoclonal antibodies from the CODATA/IUIS (International Union of Immunological Societies) Hybridoma Data Bank
- Description of plans for an on-line version of the Beilstein Handbook of Organic Chemistry
- Announcement of the new 1986 CODATA Recommended Values of the Fundamental Physical Constants
- Presentation of an overview of scientific databases in the Peoples Republic of China

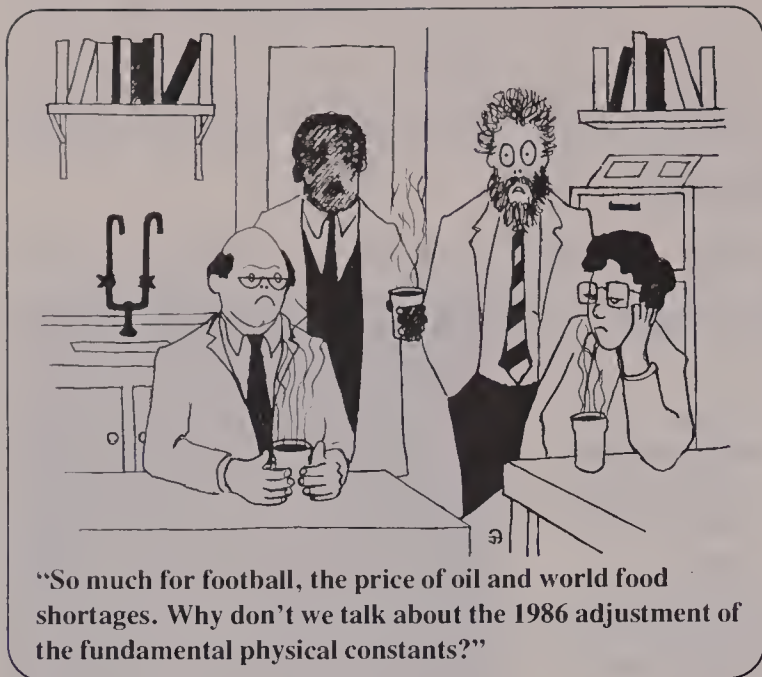
Dr David R. Lide who was elected President of CODATA by its General Assembly this year. Dr Lide is also President of IUPAC's Physical Chemistry Division.



- Report of the results of a CODATA project on multisatellite thematic mapping in Tanzania
- Description of new approaches to a relational database structure for properties of engineering materials
- Consideration of expert systems for use in data evaluation and retrieval
- Advances in the modelling and three-dimensional display of protein structures
- Report on radiological data collection in the aquatic environment after the Chernobyl accident



(From left to right) Lev Gurvich (USSR) makes a point to E. Richard Cohen (Fundamental Constants Task Group) and Alain Bussard (Secretary General) between sessions.



The conference emphasized common features of data management and database design in the various scientific disciplines. A strong theme throughout the conference was the growing database management capabilities of microcomputers and the prospect for dissemination of databases in personal computer (PC)-compatible formats for use by individual scientists. Many prototype databases of this type were demonstrated.

CODATA, the Committee on Data for Science and Technology of the International Council of Scientific Unions, was founded in 1966 to promote the compilation, evaluation, and dissemination of numerical and factual data in all fields of science. Its membership includes 18 nations and 15 international unions covering the physical, biological, and geosciences. In addition to organizing the biennial International Conference, CODATA establishes Task Groups to address specific problems in data management, quality assurance, format standardization, and other areas.

The 15th CODATA General Assembly, which followed the Conference, authorized 11 Task Groups for the 1986–88 period. These include new projects on the implementation of a prototype Microbial Strain Data Network and the establishment of standard formats and terminology for engineering materials databases. New officers elected by the General Assembly are:

President: David R. Lide (National Bureau of Standards, USA)

Secretary General: Alain Bussard (Pasteur Institute, France)

Kwauk Mooson
(Beijing)
describes
Chinese
Databases.



The Proceedings of the 10th International CODATA Conference will be published early in 1987 by North Holland Publishing Company. Further information on the Conference and General Assembly, as well as CODATA publications and other activities, can be obtained from the CODATA Secretariat, 51 Boulevard de Montmorency, 75016 Paris, France (Telephone 1-4525-0496) or the Office of Standard Reference Data, National Bureau of Standards, Gaithersburg, MD 20899, USA (Telephone 301-975-2200).



Microcomputer retrieval on Referral Data Group software.

Summary of the 1986 Recommended Values of the Fundamental Constants

The table below contains an abbreviated set of some of the more useful values with uncertainties expressed as one standard deviation, based on a least squares adjustment with 17 degrees of freedom. The digits in parentheses are the one-standard-deviation uncertainty in the last digits of the given value. Since the uncertainties of many of these quantities are correlated the full error matrix must be used in evaluating the uncertainties of other quantities computed from them.

The summary is taken from "The 1986 Adjustment of the Fundamental Physical Constants: A Report of the CODATA Task Group on Fundamental Constants" prepared by Barry N. Taylor and E. Richard Cohen and published in *CODATA Bulletin*, No. 63 (1986).

Quantity	Symbol	Value	Units	Relative uncertainty (ppm)
speed of light	c	299 792 458	m s^{-1}	defined
permeability of vacuum	μ_0	$4\pi \times 10^{-7}$	N A^{-2}	
		12.566 370 614 . . .	10^{-7} N A^{-2}	defined
permittivity of vacuum, $1/\mu_0 c^2$	ϵ_0	8.854 187 8176 . . .	10^{-12} F/m	defined
Newtonian constant of gravitation	G	6.672 59(85)	$10^{-11} \text{ m}^3 \text{ kg}^{-1} \text{ s}^{-2}$	128
Planck constant	h	6.626 0755(40)	10^{-34} J s	0.60
$h/2\pi$	$\hbar$	1.054 572 66(63)	10^{-34} J s	0.60
elementary charge	e	1.602 177 33(49)	10^{-19} C	0.30
electron mass	m_e	0.910 938 97(54)	10^{-30} kg	0.59
proton mass	m_p	1.672 6231(10)	10^{-27} kg	0.59
proton-electron mass ratio	m_p/m_e	1836.152 701(37)		0.020
fine structure constant	α	7.297 353 08(33)	10^{-3}	0.045
-, reciprocal	α^{-1}	137.035 9895(61)		0.045
Rydberg constant	R_∞	109 737 31.534(13)	m^{-1}	0.0012
Avogadro constant	L, N_A	6.022 1367(36)	10^{23} mol^{-1}	0.59
Faraday constant	F	96 485.309(29)	C mol^{-1}	0.30
molar gas constant	R	8.314 510(70)	$\text{J mol}^{-1} \text{ K}^{-1}$	8.4
Boltzmann constant, R/N_A	k	1.380 658(12)	$10^{-23} \text{ J K}^{-1}$	8.4
Stefan-Boltzmann constant, $\pi^2 k^4/60 \hbar^3 c^2$	σ	5.670 51(19)	$10^{-8} \text{ W m}^{-2} \text{ K}^{-4}$	34
electron volt, $(e/C) \text{ J} = \{e\} \text{ J}$	eV	1.602 177 33(49)	10^{-19} J	0.30
(unified) atomic mass unit, $\frac{1}{12} m(^{12}\text{C})$	u	1.660 5402(10)	10^{-27} kg	0.59

Affiliate scheme progresses

By September this year 5500 chemists from the 36 countries listed below had enrolled as Affiliates:

Algeria	Jamaica
Argentina	Japan
Brazil	Kenya
Chile	Malaysia
China	Mexico
Colombia	New Zealand
Denmark	Nigeria
Ethiopia	Papua New Guinea
Federal Republic of Germany	Philippines
France	Republic of Korea
Ghana	Singapore
Hungary	Solomon Islands
India	Sri Lanka
Ireland	Sweden

Switzerland
Tanzania
Thailand
Turkey

UK
Uruguay
USA
Zambia

Affiliate Database

The membership details of all Affiliates who have returned the blue registration forms are currently being entered on the Affiliate Membership Database at the IUPAC Secretariat in Oxford (see *CI*, Vol. 8, No. 5, p. 2, 1986). Lists of Affiliates who have indicated a specific interest in a commission will be sent to Commission Chairmen. Only Affiliates from countries represented by a National Adhering Organization (NAO) will be eligible for recruitment onto commissions. A list of NAOs and member countries is given in the inside back cover of *CI*.

Publication of 'Purple Book' postponed

It is now anticipated that the *Compendium of Macromolecular Nomenclature* or 'Purple Book' will be published towards the end of 1987. The postponement of the book, which is being prepared by the Commission on Macromolecular Nomenclature, is to allow for the inclusion of some additional reports which are currently passing through the IDCNS approval procedure. A further reason for the postponement is that IUPAC has decided to publish the book from composed type. This is expected to enhance the appeal to readers. The book will be published by Blackwell Scientific Publications (see *CI*, Vol. 7, No. 4, p. 38, 1985).

New date and location for CHEMRAWN IV

An international conference and workshop entitled "Modern Chemistry and Chemical Technology Applied to the Ocean and its Resources" will be held during the week of 4–9 October 1987 at the Keystone Conference Center, Colorado. The conference is the fourth in the CHEMRAWN (Chemical Research Applied to World Needs) series sponsored by IUPAC. One hundred scientists will participate with fifty drawn from the pure and applied chemistry and fifty from the marine chemistry communities.

Five topic areas have been selected for intensive consideration:

- Free radical chemistries, particularly those induced by light
- Reactions at marine particle surfaces
- Models of sea-water systems, particularly irreversible models
- Air–sea interface chemistries
- Sediment–sea interface chemistries

The ultimate goal of the conference is to explore the role of a deeper understanding of the nature of sea water and of the reactions that occur within the marine system in contributing significantly to the social and economic welfare of mankind.

Co-chairmen of the Program Committee are Prof. Alan Bard of the University of Texas at Austin and Prof. Edward Goldberg of the Scripps Institution of Oceanography. Dr Derek W. Spencer of the Woods Hole Oceanographic Institution is chairman of the Organizing Committee.

Chemical thermodynamics

Several new fields of thermodynamics were presented in special sections at the 9th IUPAC Conference on Chemical Thermodynamics which took place in Lisbon, Portugal, in July this year. These

included solubilities in supercritical-fluid mixtures, planetary thermodynamics and biothermodynamics. Approximately 380 scientists from 31 countries attended the conference. The next conference in this series will be held in Prague, Czechoslovakia in 1988.

Crosslinked epoxies

The relations between synthesis, processing, structure and properties were emphasized at the 9th Discussion Conference of the Prague Meetings on Macromolecules, Czechoslovakia, 14–17 July this year. The understanding of these relations is particularly valuable since it enables chemists, physicists and engineers to prepare and apply epoxy polymers much more efficiently. The conference was attended by about 150 scientists from 23 countries.

The discussion at the meeting showed that the solution of some topical problems might be favourably affected by international cooperation coordinated by IUPAC. The establishment of a Working Party on Polymer Networks within the Commission on Polymer Characterization and Properties, which is presently being considered, was therefore recommended.

The Discussion Conference in Prague was preceded by the 29th Microsymposium on Macromolecules Synthetic Polymeric Membranes. About 130 scientists from 20 countries participated at this microsymposium.

Successful symposium

Over 280 participants from 19 countries attended the International Symposium on Organic Chemistry in Technological Perspective held in Jerusalem, Israel, 1–6 June. The participants included 126 from industry and another 125 from universities. The meeting, which was the first of its kind, was considered to be most successful. Many participants recommended that a second symposium should be held in three years' time in a country with strong university–industry interactions.

Human Toxicity

An IUPAC-sponsored symposium on biochemical and cellular indices of human toxicity in occupational and environmental medicine was held in Milan, Italy, 19–22 May this year. Special emphasis was placed on the biological indices of human toxicity with respect to the liver, kidneys, the brain and blood. Approximately 300 participants from 30 countries attended the symposium.

What did not happen in 1984 (and 1616)

In 1984 Dr Bryant Rossiter did *not* enter the University of Utah as a chemistry major — as reported in *CI*, Vol. 8, No. 4, p. 6 (1986). Rossiter actually entered the University of Utah in 1948 (we'll see if we can get it right this time). However, congratulations to Rossiter for becoming 36 years younger, at least temporarily, and apologies to him (and George Orwell) for getting the year wrong.

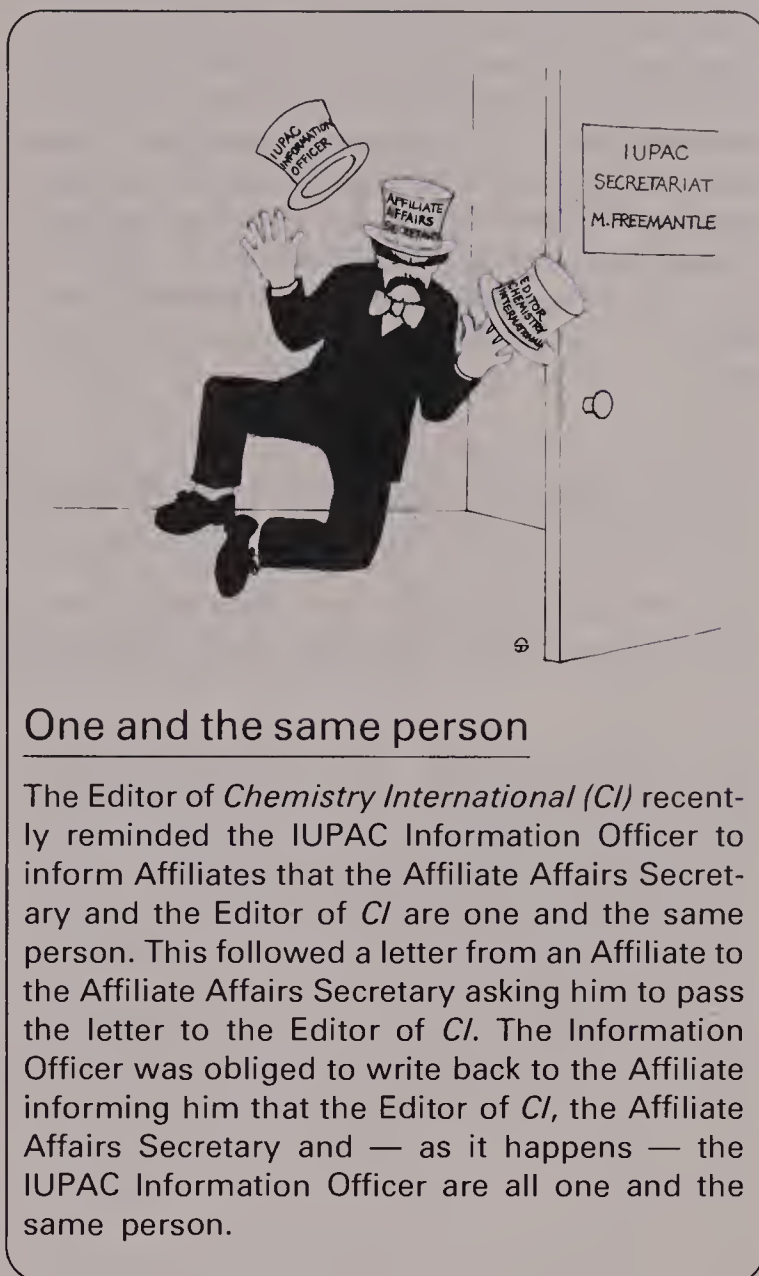
In 1616 (here we go again), the Royal Society was *not* founded as stated in Dr Wolfgang Fritzsche's article on 'Chemical societies in industrial countries — their past and future roles in development' which appeared in the same issue of *CI* (pp. 13–16). The first meeting of the Royal Society took place in London in 1660 and the first Royal Charter granted in 1662. Thanks to Prof. Thornburn Burns who made us aware of this information.

New President in The Philippines

The newly elected president of the Integrated Chemists of the Philippines is Dr Benigno S. Peczon. He succeeds Dr Rogelio P. De Leon (see *CI*, Vol. 8, No. 5, p. 4, 1986).



Dr Ken Marsh on a recent visit to the IUPAC Secretariat. Dr Marsh, from Texas A&M University, USA, is Chairman of the Subcommittee on Physicochemical Measurements and Standards and Coordinator of a book project on Recommended Reference Materials and Methods for the Realization of Physicochemical Properties. The book, to be published by Blackwell Scientific Publications in Spring 1987, will consist of a series of reports from PAC.



One and the same person

The Editor of *Chemistry International (CI)* recently reminded the IUPAC Information Officer to inform Affiliates that the Affiliate Affairs Secretary and the Editor of *CI* are one and the same person. This followed a letter from an Affiliate to the Affiliate Affairs Secretary asking him to pass the letter to the Editor of *CI*. The Information Officer was obliged to write back to the Affiliate informing him that the Editor of *CI*, the Affiliate Affairs Secretary and — as it happens — the IUPAC Information Officer are all one and the same person.

“Make sure you put that in the minutes,” says Dr Ivor Williams (Chairman, right) to Mr P. Dass Gujral (Secretary) during the most recent meeting of the Committee on Publications. The Committee met at the IUPAC Secretariat, Oxford, 23–25 June.



Award for technological achievement

Congratulations to Prof. Ray Wetton, Secretary of the Commission on Polymer Characterization and Properties for receiving the Queen's Award for Technological Achievement on behalf of Polymer Laboratories — a company based at Loughborough, UK. Wetton is chairman of the company and also Professor in the Department of Chemistry at Loughborough University of Technology. The award was made to the company for the development of its dynamic mechanical thermal analyser (DMTA).

We regret to record the death of:

Prof. G. Emschwiller, France (10 June 1986) — Physical Chemistry Division Committee (1961–69).

Prof. E. A. Pearson, USA (31 August 1985) — Commission on Water Quality (1971–79).

Prof. D. H. Richards, UK (20 April 1986) — Macromolecular Division Committee (1983–).

A typical day in the life of Prof. D. B. Tonks

Prof. David Tonks is Director of the Division of Clinical Chemistry at Montreal General Hospital. He has been actively involved with IUPAC since 1966. Below, he describes a typical working day in his life.

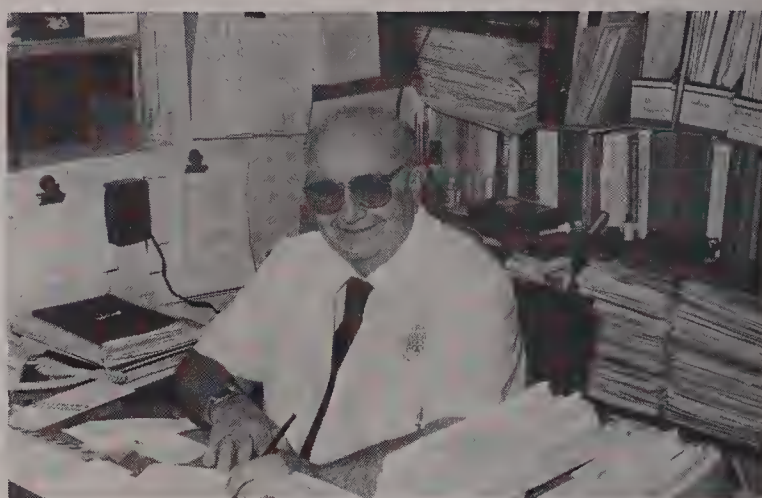
I am a working clinical chemist: the director of a large, active, university hospital division which performs many different types of tests on various biological specimens every day (and hour) of the year. It is not possible to outline a typical day for me without describing briefly the service my division provides.

A staff of 45 persons, including 2 medical biochemists, 5 chemists, and 35 medical technologists, perform 120 different tests ranging from blood gases, trace metals, enzymes, electrophoreses of proteins, poisons, therapeutic drugs, lipids, and electrolytes, etc. to simple routine urinalysis. On an average day, we receive specimens (blood, urine, stool, or fluids) from about 800 patients. We treat each specimen as if it is infective. Our emergency laboratory operates continuously, performing close to 1900 tests every day. Our total work load involves the performance of 3.5 million tests a year. Turnaround time is important, and the results of some tests can be required in 5 minutes.

To meet the ever-increasing demands, we rely heavily on automation and computerization, but still do many tests manually. We are always short of money and some of our equipment is too old, but we manage to survive somehow. Why anyone would want to direct such an operation, I really do not know, because it is a high-pressure, stressful job. Probably, it is because it is always interesting.

A 6.30 a.m. start

My own day starts at 6.30 a.m. in my very comfortable house in a quiet suburb of Montreal, namely Dorval, which contains a famous airport. This largely English-speaking city of 25 000 persons



Professor Tonks in his office.

is known for its recreational facilities and its closeness to beautiful Lac St Louis, part of the St Lawrence river system. After my typical breakfast of a boiled egg, one slice of toast with jam, and a cup of tea, I drive on 6 days a week the 12 miles to the Montreal General Hospital where I work.

This hospital is in the heart of Montreal, sitting on the side of Mount Royal about three quarters of a mile from McGill University. The hospital is one of the three large hospitals associated with the well-known medical school of McGill, along with several other smaller and specialty hospitals. But funding for these hospitals is provided by the Federal and Provincial Governments, not by the University, since we have a complete system of Medicare in Canada. I also serve as a Consultant to a large private laboratory chain, and to the Clinical Laboratories of the Douglas Hospital in Verdun, a large psychiatric hospital.

My daily drive to work is much more pleasant in spring, summer, and autumn than in our long winter period of five months, when there can be

Prof. D. B. Tonks was born in Edmonton, Alberta, Canada, in 1919 and graduated from the University of British Columbia, Vancouver, in 1941. He was awarded his PhD by McGill University, Montreal, in 1949. In 1948 he was Senior Chemist at what is now the Canadian Centre for Disease Control, Ottawa, and in 1958 moved to Toronto as Biochemist and Research Associate at the Hospital for Sick Children. In 1962 he became Director, Division of Clinical Chemistry, Montreal General Hospital and Assistant Professor, Faculty of Medicine, at McGill University — becoming Associate Professor in 1967 and Professor in 1975.

Prof. Tonks is interested in a very wide spectrum of clinical chemistry including quality control, application of automatic apparatus and computers, standards and standardization, hospital toxicology and industrial pollution, teaching, drug monitoring and trace metal analyses. He is active in many Associations and Societies and has several consultancies. For six years he was Associate Editor, then Editor-in-Chief of *Clinical Biochemistry*.

He was Canadian National Representative to the (then) Section of Clinical Chemistry in 1966 and was elected Section Secretary in 1967 and Chairman from 1971 to 1975. He was an Associate Member of (now) Commission VII.4 in 1973, Titular Member in 1977 and is now Secretary. He was a coopted member of Division VI from 1975 to 1977 and was elected to the Bureau in 1979 and re-elected for a second four-year term in 1983.

much snow and cold. Montrealers learn to be experts in driving in all kinds of weather; in winter, however, we rely heavily on salt to eliminate ice from the roads. I always enjoy driving a car and listening to the radio, and find that many of my good ideas come while driving back and forth to work.

Trouble shooting

My first task at work is to visit my senior staff to find out if there are any problems with equipment or personnel. Some of these may have developed during the night or over weekends. Since we are on a very tight budget, we usually are short of staff and are forced to use some obsolete equipment that has seen better days. Our automatic analysers, which are quite new, require considerable expertise to operate, but one of my greatest assets is an experienced staff which soon has all operations proceeding smoothly. However, if any one of our tests is in trouble, I can expect a quick call from a supervisor or our quality control chemist to make

me aware of the problem, and to keep me informed of the necessary corrective action which is being carried out.

I pride myself on my detailed knowledge of every analytical procedure and on my ability to predict the reasons for problems; these may be due to poor methodology, bad reagents, inaccurate standards, instrument malfunctions, improper training of an analyst, etc., etc. A clinical chemist must be a fast-acting and successful trouble shooter since many of the test results are required quickly in order to treat the patients properly.

An extensive quality control system is essential for ensuring adequate precision and accuracy for every test every day; quality control has been one of my specialties. With the complicated, computerized equipment of today, there is usually little we can do to make repairs, and we must rely heavily on the availability of service engineers.

Appointments and meetings

When operations have settled down to their regular production routine, I look over my appointments for the day, which can include a department meeting (Department of Medicine), attendance at medical rounds, an equipment or computer committee meeting, a seminar in medical biochemistry which we teach, a staff training session, a budget meeting, a laboratory directors' meeting, or consultations about tests with individual members of the medical staff. There are also faculty meetings and special university lectures to attend. But if my commitments for the day are not too heavy, I can spend part of my morning at least preparing lectures or writing articles or book sections for publication. This spring I prepared two book sections about the estimation of cadmium in biological fluids, and at the present time I am preparing a lecture on quality control to be given to clinical chemists in Taipei and Hong Kong at the end of July, after the Comtox III meeting (IUPAC Commission on Toxicology) to be held in Kitakyushu, Japan. I also am preparing for the Commission on Toxicology meeting to be held in Ghent, Belgium in late August, and for the Bureau meeting in Oxford in late September as an elected member.

Usually I and my senior chemists have lunch together at the hospital in the doctors' dining lounge, and take this opportunity to discuss our problems and to talk with medical doctors. We might, for example, talk over the results of research projects. This may not be the healthiest way to spend our lunch time, but there is rarely any other time to get together on a regular basis. Research and development is of course essential if we are to maintain a modern clinical chemistry service; we change a number of methods every year and each new one must be carefully studied before installation.

My own role in the division is largely administrative and collaborative rather than that of primary researcher. One cannot give personal direction to a large clinical chemistry service and be an ardent investigator at the same time. It is most practical for my senior staff to dedicate themselves to research at least 50% of the time, and for me to provide them and my laboratories with the proper facilities for their work. But I do manage to direct some personal research projects, also.

My greatest pleasure at work is derived when my division can provide new or better tests which can help the patients and may be life-saving. In a hospital, patient care of course is of primary importance. Our greatest satisfaction on a given day may result from helping a physician to diagnose a myocardial infarction, say, by our performance of creating kinase and lactic dehydrogenase isoenzyme fractionations. Or we may be able successfully to differentiate between bone and liver disease by use of a heat-stable alkaline phosphatase estimation. Or by providing a therapeutic drug level we may be able to detect that a patient has accumulated too much of the drug thus explaining why he has developed toxic symptoms. Or we can play a vital role to the patients after surgical operations by providing accurate blood, gas and electrolyte (Na, K, CO_2 , and Cl.) analyses; these must be supplied very quickly.

'My greatest pleasure at work is derived when my division can provide new or better tests which can help the patients and may be life-saving.'

After lunch, I usually must attend one of the many meetings that take place in a large university hospital. When this is over, I usually visit each of my 10 laboratories to determine how the work is progressing and to discuss any problems with the technologists. Then I can settle down to my own work of administration (much of this is to provide information to our hospital management or to the government) or possibly do some writing.

The best part of the day arrives at 4 p.m. when the bulk of our 12 000 tests a day are completed and reported, and the technical staff is leaving. I can then do my own work without interruption for at least an hour and a half. My office contains many thousands of reprints, most pertinent journals and many of the latest books on clinical chemistry, therefore I have excellent information at hand to help me with my writing and to give me ideas about possible improvements to our service. One of my responsibilities is of course to keep abreast of the scientific and professional clinical chemistry literature.



Technicon SMAC Analyser, with attached microcomputer. This apparatus can determine 20 components simultaneously in 150 blood or urine specimens per hour.

IUPAC activities

Any time that I have left over will be devoted to the many professional societies — local, provincial, national, and international — to which I belong. For example, at present I am co-chairman of the joint meeting of the Canadian Society of Clinical Chemists and the American Association for Clinical Chemistry to be held in Chicago in mid-July. About 10 000 participants will attend this large meeting which will offer many symposia and over 700 proffered papers, as well as workshops, round table discussions, and over 700 exhibitor booths to attend or visit.

'IUPAC has certainly earned my great respect because of its own impeccable standards, scientifically and administratively.'

Clinical chemists have many professional problems, not the least of which is their status among the practising physicians. It is quite difficult today to keep up with the many new developments in this active field of chemistry in medicine, and restrictions on funding are causing many changes in laboratory medicine. There is great concern about the use of "black boxes" for performing tests in doctor's offices. Standards such as those provided by IUPAC, IFCC, WHO, NCCLS, ECCLS, and other organizations are very important for the provision of proper health care through chemistry.

I spend part of most working days on IUPAC activities, and have gained much satisfaction from this. IUPAC has certainly earned my great respect because of its own impeccable standards, scientifically and administratively. IUPAC and the IFCC, an affiliated association, have provided true leadership internationally in the field of Clinical

Chemistry. My own contributions to IUPAC activities have been quite extensive, I believe, and I hope that, when my official terms are over, I can continue to participate through the new Affiliate Scheme.

My evenings are usually spent relaxing with my wife, and perhaps with the other four members of our grown-up family. I am trying to spend more time with them. And nowadays I do little scientific work at night. My wife particularly relishes this since she has spent many, many hours waiting while I have attended sessions at meetings. She says "It is now time for you to wait for me, at least occasionally."

She has attended many IUPAC meetings, and these have given her, and me, opportunities to see many countries. But my free time at these meetings has been quite limited. We both love to travel, and have driven West across Canada six times in order to visit my parents in British Columbia. Our other activities involve our church, and looking after the lawns and grounds surrounding our home. Our health is good, and we expect to enjoy many more years of good living. We believe that Canada is one of the best (perhaps the very best) countries in which to live and work, and are very pleased about our lives here; we have indeed been fortunate. Some day we may find time to take a real holiday with nothing planned ahead of time.

I must take this opportunity to say how much I have enjoyed my personal association with many members of IUPAC over my 19 years of service. Incidentally I am not much in favour of restricting the years of service of any person who is making a valuable contribution to IUPAC; good workers are sometimes hard to find. Let us all hope that IUPAC can be even more useful and productive in future years.

Faulty wires

Faulty wires shocked members of the Commission of Toxicology (VII.4) when they came to read an account of their Lyon meeting published in *CI* earlier this year. The account, entitled 'Toxicology Commission is restructured' (see *CI*, Vol. 8, No. 1, pp. 42–43, 1986) referred to the analyses of 'wire cadmium', 'wire selenium' and 'serum and wire'. The report should have referred to the analyses of 'urine cadmium', 'urine selenium' and 'serum and urine' respectively. We are grateful to Prof. Tonks for drawing these faulty wires to our attention. The editor apologizes to all concerned. He confesses that he was not plugged in at the time.



"It's either wire, wine or urine".

Global significance of mycotoxins

Dr C. W. Hesseltine

Mycotoxins are poisons produced by fungi. They have a pronounced impact on the quality of food produced throughout the world and can also cause a variety of animal and human diseases. In this paper* Dr Hesseltine surveys the global significance of mycotoxins. He raises some important questions and puts forward a number of suggestions for further work in this field.

Three mycotoxin problems

In the first part of this paper I would like to discuss three mycotoxin problems which are of most concern on a worldwide basis. These problems are general in nature and do not refer to any one mycotoxin commodity or region of the world.

First of all, there is worldwide concern at present about world food supply both now and in the future. Research is striving to increase the quantity and quality

of the food supply on a global basis. We know a great deal about animal nutrition, the importance of vitamins, the proper balance of amino acids, trace elements and the prevention of disease with drugs, vaccines, and sanitation.

*This paper formed part of the keynote address presented at the IUPAC sponsored 6th International Symposium on Mycotoxins and Phycotoxins held in Pretoria, Republic of South Africa, July 1985.



Dr Clifford Hesseltine who is Chief of the Fermentation Laboratory, Northern Regional Research Center, USDA, Illinois, USA.

What has not been taken into account until recently is the effect of inhibition of animal growth by low levels of natural toxicants, especially mycotoxins. For example, the broiler industry in the USA is highly developed and efficient in meat production because of agricultural research. Papers have appeared that demonstrate that mycotoxins are the cause of some problems in the broiler industry. This industry produced 17 037 999 000 pounds of broiler chickens in 1983, according to USDA's Agricultural Statistics for 1984¹. Let us assume that the weight gain was reduced only 3% due to low levels of mycotoxins in the feed. The figure of 3% is just a guess: we really don't know the magnitude of the loss. A 3% loss would be 511 139 970 pounds of meat we could have had were all the effects of mycotoxins removed from the birds' diet. At 28 cents a pound the loss amounts annually to more than 143 million dollars.

Complete elimination of this loss cannot be attained, but it is a problem important enough to be attacked not only in the USA but throughout the world. Losses in some other parts of the world are almost certainly higher. Our problems are similar because moulds know no borders; the same fungus species produce aflatoxin in the USA as in India or Africa.

Secondly, insufficient attention has been given to the effect of some mycotoxins on the immune system in animals and man. Research has established beyond a doubt that some fungal toxins, such as aflatoxin, cause the animal's immune system to be reduced or destroyed. When low levels of mycotoxins are ingested by an animal, and then the animal is challenged by an infective microorganism, the animal's immune defences are reduced and they succumb to disease; whereas control animals not receiving low levels of toxin respond immunologically.

Richard *et al.*² point out that various immune systems are affected. Thus, resistance to disease is lowered, acquired immunity is interfered with, antibody production and cellular immunity are changed, and mechanisms of defence such as phagocytosis are altered. For example, turkeys and chickens fed 0.25–0.5 ppm of aflatoxin B₁ during or after immunization to *Pasteurella*

multocida (fowl cholera) were found not to be protected from this disease when exposed to challenge. Birds feeding normally without aflatoxin were protected.

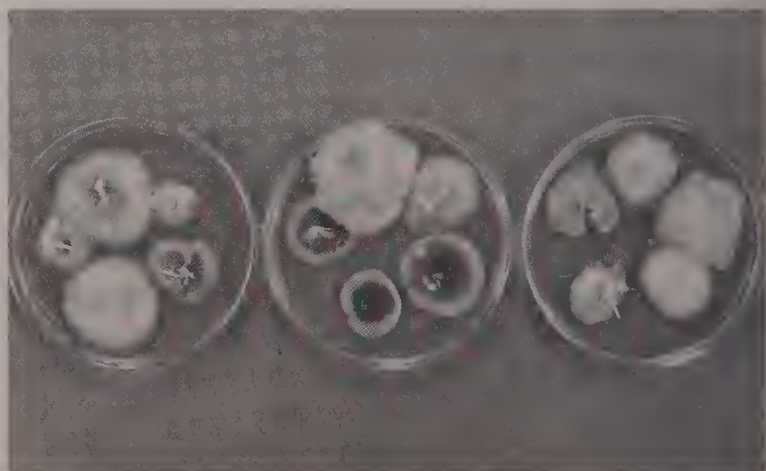
However, not all mycotoxins affect the immune system and, in fact, aflatoxin appears not to affect some animal/infective agent systems. Obviously, much more research is needed in this field in both domestic animals and humans, including an examination of the behaviour of a variety of the more important mycotoxins.

A third area of concern is the importance of mycotoxins in human health. Illness in humans caused by mycotoxins may be a larger problem than anyone realizes. This is especially true in countries where foods are often in short supply and poor quality mouldy foodstuffs have to be used to avoid starvation.

Food poisonings caused by bacteria and moulds generally differ in the time that elapses before the poisoning effects are felt. Bacterial poisoning is typically quick and violent. Enterotoxin produced by *Staphylococcus* makes the patient ill within a few hours and the onset is often violent, with vomiting and acute feelings of illness. With mycotoxins longer periods of time elapse between ingestion and recognition of symptoms. This is usually recognized by haemorrhages in one or more internal organs.

Mycotoxins were first recognized as a result of poisoning to humans rather than animals.³ Toxins produced by mushrooms such as *Amanita*, as well as ergot poisoning, were known in ancient times. These toxins are exceptions to the rule that fungal toxins are slower acting. Several diseases in man are known to be caused by mould products. These include dermatosis from psoralens in celery in the USA; alimentary toxic aleukia in Russia; poisoning caused by eating yellow rice in the Orient; *Phoma sorghina* causing onyalai disease in Africa; acute aflatoxin toxicity in corn in India; and the red mould scab in the Orient in wheat and barley (Akakobibyo disease).

In addition to these proven poisonings of man by moulds, a number of diseases are thought to be caused by mycotoxins. These include Balkan nephropathy, Reye's syndrome, Kashin-Bech in Siberia, epidemic polyuria in India, dendrodochium in Russia and an acute cardiac type of beriberi in Japan.



Various moulds including mycotoxin producers growing out of surface sterilized wheat kernels.

A number of chronic diseases in humans occur where the causative agent is not known. Most likely, some of these are caused by the ingestion of mycotoxins or a combination of mycotoxins and other toxins or infective microbial agents. Especially suspect would be illnesses in areas where mouldy food products occur. However, the fact that the food was made from plants infected with plant pathogens should not be overlooked even though no mould grew on the harvested crop. The toxin might have been produced in growing plants before harvest.

Mycology and taxonomy of fungi

All commodities, unless they are processed with heat or chemicals, are inhabited by a mixed mould flora. For example, wheat flour always contains a small but regular population of *Aspergillus candidus*. In a few commodities, the regular flora has been determined not just for one year but for several years. This then gives a base line for the regular flora in each commodity. This flora determination has been done for some of the world's major cereals. However, many other products exist where the normal flora either is not known or only for a restricted area.

We need more studies of this nature on the floras of good quality products. This information can tell us which moulds need to be examined for possible mycotoxins in each commodity. Unusual numbers of the normal flora or moulds not typically associated with the usual flora, indicate that the product has been mishandled and needs to be viewed with suspicion.

There is no need to look for toxins in the many fungi that never grow in our food and feed supply. Research should be concentrated on those fungi that either regularly inhabit the commodity or sporadically develop when the product is mishandled. For example, it is a waste of time to look for toxins of *Absidia glauca*, a strictly saprophytic mould in soil, as compared to *Absidia ramosa*, a regular inhabitant of cereal grain. No toxin has been identified for this latter species, but it is known to induce infections in animals. *Alternaria* is seldom found in corn unless it is grossly mishandled, but examination of grain sorghum indicates that *Alternaria* is almost always present. Therefore, when examining sorghum for toxins, one should certainly evaluate the various toxins produced by this genus.

Basic studies are needed to establish the normal mycoflora of each commodity, not just in one year or in one geographical location. Since *Penicillium* is such an abundant fungus in cereals this genus should be systematically investigated for toxins. I suggest that 10 strains of each species should be grown on two or three substrates such as corn, rice, and soybeans, and then checked for toxin activity in chickens and rats. In the drug industry's screening for antibiotics, many *Penicillium* isolates were found to be toxic to test animals, but these data have not always been published.

Taxonomic research should be directed at problems of identification of toxin-producing fungi. For example, a few years ago a study was made by Miss Dorothy Fennell and associates of the *Penicillium viridicatum*



Wheat contaminated with *Fusarium*. The kernels are shrunk and white.

isolates. In *P. viridicatum* three distinct taxonomic groups were separated on the basis of their toxins: group 1 produced no toxin; group 2 produced citrinin and ochratoxin together or singly and group 3 produced only ochratoxin in 9 out of 13 isolates. There were slight but significant morphological differences as well as differences in rate of growth, colony colour, type of growth, odour, and source of isolates. Group 3 came from meat products, whereas groups 1 and 2 came from wheat, peanuts, beans and corn. Further study might have demonstrated that each type had consistent differences and that the three groups actually represented three species.

Fusarium moniliforme is a common mould in corn. Studies in the USA have demonstrated mutagenic metabolites in strains of this fungus. Research needs to be directed to determining the percentage of strains which produce toxins and to determine substrates the mould uses and what byproducts it produces when it grows in corn. In only a relatively few fungi have the optimal conditions for the medium, time, temperature, and physical nature of the substrate been determined for mycotoxin formation.

Studies should be made on the viability of the mould in the commodity, as well as stability of its mycotoxin. To be of any significance, the study must be done with the mould grown in the commodity not on laboratory media.

A method is needed to determine the amount of living and dead mycelium in the substrate. Plate counts are of no value and, although considerable work has been directed to this need, no satisfactory method is yet available for a mixed mould flora. There is also a need to study why certain moulds, especially *Fusarium*, lose their ability to give high levels of toxin. Presumably, there are ways of inducing poor producers to increase their mycotoxin yield. Furthermore, we need to determine the role virus-infested strains play in mycotoxin production and whether good toxin producers are virus-infected or virus-free.

Ecology

By ecology, I mean the role the toxin-producing fungi play in mycotoxin formation. Fungal ecology deals with the mutual relations between organisms and their environment.

Further study needs to be done on finding the regions of the world where specific mycotoxin-producing fungi occur and where their mycotoxins are regularly found. For instance, we know that corn grown in the tropics or sub-tropics is regularly contaminated with aflatoxins.

Studies need to be made on plant material infected with plant pathogens for mycotoxins. Instances such as ergot and slaframine are known to occur. One wonders about the cereal smuts, rusts, blights and root rots.

Investigations should be made on how the reservoirs of spores are preserved between growing seasons. Are they in the soil, on debris or in storage bins? How does the seed become infected in the field or in storage? Are wounds required or, if not, then how does the fungus germ enter the plant? We know that some fungi can enter the plant through undamaged surfaces. Much of this work will have to be conducted in controlled environments. Research will therefore be expensive. One cannot help but believe that insects play an important role in transporting the inoculum and in producing injury to the plant, especially to seed in the field.

An exciting field of research now emerging involves the interaction between the mycotoxin-producing fungus and other moulds growing in association with it. Several years ago we made a study of a natural contamination of stored corn in which both zearalenone and aflatoxin were present. Even though kernels were attached to each other by mycelium, upon analysis individual kernels were found to contain only zearalenone or aflatoxin, but never both.

Breeding host resistance to a mycotoxin-producing fungus is possible for those that are true pathogens, but breeding resistance in plants to saprophytes seems more difficult and the results thus far have not been promising. Probably the only resistance of any importance would be the establishment of resistance barriers such as epidermal cells containing a mould inhibitor.

The movement of mycotoxins from one part of the plant to another is another area to be investigated. Aflatoxin appears not to migrate in plants, but what about other toxins?

Optimal conditions for growth and toxin production are known for a few fungi but there are many others where these are not known. Likewise, we know little about conditions that inhibit mycotoxin production. For aflatoxin information, we know that high temperature or high moisture levels affect production. Many of our studies are made under controlled conditions that remain constant during the experiment. Still, in nature, there are daily changes in temperature, available moisture, and growth of competitors.

A great deal more research needs to be done on the location of the mycotoxin in the plant. One level is in plant parts: seeds, leaves, stem, roots. A second level is the amount of mycotoxin in the various cellular tissues, for instance, corn germ. We know from work on peanuts that there is a varied distribution pattern of aflatoxin within a single seed. Does the invasion of one fungus, for example into a corn kernel, make it easier for a mycotoxin producer to enter and produce a toxin?

It is well established that some fungi are geographic-



Corn kernel showing *Aspergillus* sporulating from tip and a crack.

ally restricted to certain parts of the world. Are any of these important in their local area as toxin producers?

Surveys

Surveys for various mycotoxins depend upon accurate, dependable analytical methods. The lack of a good assay is probably the major cause of our ignorance on the natural occurrence of most mycotoxins. Surveys are important because they indicate the magnitude of the problem in a commodity as well as which geographical areas are important.

Chemical methods used to assay the products should be accompanied by a mycoflora survey. A classical paper published recently told of sterigmatocystin found in a batch of cattle feed that caused feed poisoning⁴. From this feed, sterigmatocystin was isolated. *Aspergillus versicolor* accounted for 28–60% of the mould colonies in the feed. Nine isolates of this species were selected at random from the feed and all produced sterigmatocystin.

For other mycotoxins besides aflatoxin, the sample size and the number of samples collected need to be determined statistically. Research needs to be stepped up on the use of ELISA and monoclonal antibody techniques, especially for use in mixed feeds that become a problem with chemical methods because of the varying types of materials involved and the changing cost of ingredients from day to day.

Care needs to be taken in deciding to do a particular survey. Certainly, there needs to be a good indication that the mycotoxin being evaluated causes a real problem and occurs fairly often. Surveys, when done properly, are costly and time consuming and need to be carefully planned to give the most information.

Analytical methods

Probably the greatest need for research on analytical methods is the development of a quick, cheap, simple method of indicating the presence of a specific mycotoxin. The black (UV) light method for detection of aflatoxin is the type of assay to which I am referring. A negative black light test on a properly collected,

representative sample indicates that there is no danger. A positive black light test does not say that aflatoxin is present but it does indicate that a more definitive assay, such as the minicolumn, should be run. We have no such method for other important mycotoxins such as zearalenone, ochratoxin and others.

Analytical methods should be developed only for those mycotoxins that are known to occur naturally and for those mycotoxins in which the producing fungus is known to occur in agricultural commodities on a regular basis.

Considerable progress has been made in developing multiple assays. These are assays that can be used to detect several mycotoxins at the same time. More work needs to be done on this research to increase the sensitivity and simplicity of the assay. Multiple assays should be based on mycotoxins which are likely to occur together. For instance, ochratoxin, citrinin, and penicillic acid are likely to be found in the same places because the optimal growth conditions of the penicillia that produce these toxins are similar.

Some work has been done on the development of micromethods of analysis where very small quantities of material are available, such as parts of kernels, or of mycotoxins in or on fungal spores. Proper collection of samples and sample preparation needs more attention. For example, should the same size (weight) sample of corn and wheat be required to give meaningful results? Many fewer seeds are present in a 25 kg sample of corn than in a 25 kg sample of wheat.

Toxicology

It appears that a great amount of research on the more common mycotoxins has already been published. However, more studies appear to be needed on where and how aflatoxin M₁ is made in the animal from aflatoxin B₁.

A new effect of mycotoxins should be examined as to whether or not the consumption of low levels of mycotoxin such as T-2 affects the behavior patterns in humans. Schoental⁵ has suggested that *Fusarium* toxins may well produce psychiatric disorders. The role of ochratoxin A in Balkan nephropathy needs a great deal of research and could represent a model for study of other chronic diseases caused by mycotoxins in food consumed by man. We need to do more research on the hazards of inhalation of dust containing mycotoxins and spores by persons handling mouldy commodities such as grain and hay. Is there any relation between the allergies to mould spores and their toxin content?

Mycotoxins in animals

The field of immunology has been neglected as a quick and accurate assay for mycotoxins, both in feed and in animal tissues and excretion products. These methods, widely used in detection of bacterial toxins, were not developed for mycotoxins because the early work on detection procedures was based upon chemical and animal assays. We are now seeing the development of monoclonal antibodies, which should be especially

useful in detecting toxin in mixed feed where the ingredients may be constantly changed due to economics. Monoclonal antibodies are now available for aflatoxin and T-2 toxin.

More research needs to be done on known mycotoxins in other animal species. The effect of zearalenone on swine has been well documented but what is its effect on other animals? Much more animal research needs to be done on the interaction of two or more mycotoxins. For instance, species of *Penicillium* and *Aspergillus* often grow together and one would expect to find their toxins together. What is the effect of this mixture on the animal?

In some instances toxins are produced by fungi in the roots of plants and can be transferred in an active state to the part of the plant eaten. How widespread is this? Some of the fungi known to produce toxins such as *Fusarium* and *Trichoderma* are well-known pathogens of the roots of domestic crops.

We are well aware that when aflatoxin is consumed by dairy cattle, aflatoxin M₁ will appear in the milk. But what about other mycotoxins such as zearalenone? It is well established that there is varying resistance to aflatoxin in some varieties of chickens, and this is also true of other animals. Can resistance be bred into other species and breeds to protect the animal from a specific mycotoxin that cannot be economically excluded from the diet of the species? This may be especially important in some third world countries that depend a great deal on a specific animal for much of their protein and still have to depend on feeding contaminated feed.

A special problem exists in corn used as feed because *Fusarium moniliforme* occurs so regularly in it. Recent South American reports indicate that some strains of this fungus can cause tumors in rats and produce fusarin C, a mutagen. For example, rats fed a diet of 4% corn on which *F. moniliforme* had grown produced malignant tumors in 17 of 20 rats⁶. Corn is a special problem because it is so often infected with this fungus on a worldwide basis. What is needed is a determination of just how much corn is contaminated with this fungus, what the fungus uses in the corn for growth, and how widespread are toxins produced in corn in nature.

Suppression of the immune systems in animals is known to occur from aflatoxin and one or two other toxins have been examined for their effect on immune systems. Study needs to be broadened to other important mycotoxins such as vomitoxin and zearalenone, for example. The questions needing to be answered are whether all or most mycotoxins affect the immune system and at what levels. How long does the impairment of any of the immune system last? What is the effect of two or more mycotoxins ingested at the same time?

Not enough research has been done on the problem of detecting mycotoxins in mixed animal feeds. These feeds vary because of the modification of the ingredients due to availability and cost. Not much is known about what to do when animals become sick from mycotoxins except to get rid of the contaminated feed. What does the veterinarian tell the farmer whose herd is sick and where livelihood is threatened?

Detoxification and prevention of spoilage

Detoxification of aflatoxin with ammonia is the only satisfactory chemical method for detoxification of any mycotoxin. Methods need to be developed for the destruction of the more important mycotoxins but this requires a process that is effective, leaves no toxic residues, is inexpensive, and can be used by personnel with little training.

Little or no work has been done on the manner in which microorganisms degrade mycotoxins in nature. Hardly anything is known about the compounds produced when the mycotoxin is broken down. The use of harmless microorganisms which might be allowed to develop on a product that protects it from the development of other moulds should be explored. This method has been used to preserve fish in the Orient so that no preservative or refrigeration is required. A process used by some rodents to protect their seed caches depends on controlled mould growth on their grain supply in their underground storage chambers.

Storage of cereals in storage bins in which anaerobic conditions are maintained has not received adequate study. This method of storage is now being used commercially in some places. It is effective because most fungi will not grow under anaerobic conditions. This approach also is effective in controlling storage insects.

Engineering research on each of our major crops to find out how to reduce breakage damage to crops during harvest, drying, shipping, and storage should be given high priority. Broken seeds and fruits encourage the entrance of moulds into the product in shipment and in storage. It is better to keep mycotoxins out of our food and feed than to remove them after the food and feed have been contaminated.

Genetic studies on corn, peanuts, wheat, and other major food crops need to be done to develop varieties resistant to insects and resistant to plant pathogens which are producers of mycotoxins. Although the mechanical separation of aflatoxin-containing kernels from non-aflatoxin kernels has not succeeded, this method should be investigated from grain infected with *Fusarium* and other fungi that typically produce chaffy light kernels. The blending of contaminated and clean grain is a widespread practice. In some places this is necessary because of the scarcity of feed. More research is needed on this process to determine the safety of the blended feed.

Chemistry and biochemistry

Mycotoxins have a variety of effects on animals. It thus seems that it would be worthwhile to study any mycotoxin or its derivatives to discover useful compounds. Zearalanol is now used as a growth promoter in beef cattle. According to Prof. E. Schantz of the Food Research Institute, University of Wisconsin, botulinum toxin is now used in the treatment of certain eye diseases by utilizing the paralysis effect of the botulinum toxin.

Undoubtedly, there are many compounds to be



Aspergillus flavus sporulating from ear of corn. The corn was highly contaminated with aflatoxin.

characterized and their structure determined. Purely basic studies should be made of moulds commonly found in food and feed that show varying degrees of toxicity. This offers a good field for academic research.

Although the biosynthesis of the aflatoxins has been well worked out, much research is needed on the biosynthesis of other major mycotoxins, including the biosynthesis of the trichothecenes.

The chemistry and biological effects of intermediate compounds in the biosynthesis of the major mycotoxins need to be elucidated. Enzymes involved in the biosynthesis of the naturally occurring mycotoxins need to be isolated and characterized.

Economics

No treatment of future research on mycotoxins would be complete without a discussion of economics. We badly need information on the dollar losses for various commodities due to the growth of moulds. These data are needed by countries for each important commodity.

Secondly, we need to know the losses due to contamination with mycotoxins. That is, how much of the commodity is downgraded, thereby causing an economic loss. Or is the toxin-containing material in such bad shape that it is a complete loss except for use as fuel or fertilizer. This information is of paramount importance in deciding the direction of research.

The losses in weight gain, reproductive failures, death, and poor grade quality of animals fed contaminated feed are really unknown. These may be as high as one thousand poisonings due to zearalenone to each one that is recognized and reported. Indirect loss also follows from human illness, suffering, and death caused by mycotoxins.

Much work has been done on detoxification of aflatoxin in peanuts, cottonseed, and corn. What have been the savings? In a new process for detoxification of another mycotoxin, what are the savings? Would it be better to destroy the product or blend it off with good material to the level that would be harmless?

How do commodity losses caused by fungi compare with insect losses? The losses in strawberries must be much greater from fungi, but how about the cereals where storage insects are an enormous problem?

Farmers, shippers, and manufacturers need to be better educated in the prevention of mould growth. I remember a recent visit to a company plant that had a

recurring microbial spoilage problem. Although the manager did a thorough job of washing and cleaning both the machinery and floor, the problem still persisted. At one end of the plant was a large industrial fan that sucked dust from a dirty parking lot and dumped it into the plant. Besides the constant blast of air there was only a coarse filter that removed just rocks and cinders. The manager was quite unaware that his problem was coming through the air from the outside; the problem was easily remedied by placing the fan on the roof and installing adequate filters.

As scientists and administrators we need to evaluate how much equipment, manpower, and money needs to be allotted for research on each mycotoxin in our region.

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Wrong again!

A member of the *ad hoc* IUPAC Commission on Inadvertent Errors in *CI* (an informal Commission which, incidentally, is growing in membership day by day) has spotted yet another inadvertent error in *CI*. This one occurred in the item "HPLC assumes a major role in projects" (see *CI*, Vol. 8, No. 3, pp. 24–25, 1986). In the second paragraph of this item, a reference to the completion of new methods for solvent residues and butyric acid was omitted. Unfortunately the omission reflected on the opening sentence of the paragraph which should have read:

"Excellent progress towards the completion of a number of the Commission's projects was reported with new methods for the determination of mono- and diglyceride-based emulsifiers and the determination of the thiobarbituric acid value, the solvent residues content of oils and the butyric acid content of fats containing butterfat being finalised. Following their adoption as official methods of the Commission, the texts of the procedures and the reports of the collaborative studies undertaken for their development are now being prepared for publication in *PAC*."

Apologies to the Commission on Oils, Fats and Derivatives and particularly Commission Secretary Dennis Pocklington, author of the item.

Sofia hosts next IUPAC Congress



The 31st International Congress of Pure and Applied Chemistry will be held in Sofia, Bulgaria, 13–18 July 1987 under the auspices of the Bulgarian Academy of Sciences and IUPAC. The opening and closing ceremonies and plenary lectures will take place in the National Palace of Culture "Lyudmila Zhivkova".

The scientific programme will be divided into nine sections

- analytical chemistry
- education
- engineering chemistry
- industrial chemistry
- inorganic chemistry
- organic chemistry
- physical chemistry
- polymers
- clinical chemistry

Each section will consist of plenary lectures and half-hour presentations by invited speakers. In addition each section will have a poster session for participants wishing to present their research contributions.

The registration fees for the Congress are US-\$ 250.00 for participants, US-\$ 120.00 for accompanying persons and US-\$ 120.00 for students. Accommodation is available in local hotels and students hostels. The official language of the Congress is English.



National Palace ►
of Culture
"Lyudmila
Zhivkova".

Academician L.
Zheliazkov,
President of the
Organizing
Committee for
the 31st
◀ Congress.



The weather in Sofia at the time of the Congress is usually warm, the temperature averaging 25°C. A number of social events and tours have been arranged for participants and accompanying persons.

Registration forms and further Congress information is available from:

31st International Congress of Pure and Applied Chemistry,
Centre of Chemistry,
Bulgarian Academy of Sciences,
Acad. G. Bonchev Str., Block 11,
1113 Sofia,
Bulgaria.

Chemistry in Bulgaria

Ognyan M. Peshev

Chemistry in Bulgaria has advanced rapidly over the last three decades. How has this been achieved? In this article Ognyan Peshev answers the question by providing some historical background information and outlining developments in chemical research, education and industry in Bulgaria over the past 100 years.

Introduction

The Bulgarian state was founded in 681 AD. However, the history of chemistry in Bulgaria covers a much shorter period. It began only in the last century.

In 1396 Bulgaria lost its political independence and was absent from the family of free nations until 1878. On the eve of the Renaissance, this country, which in the Middle Ages had given the whole of Slavdom literacy and education, and which had been in trade and political contact with the Kingdom of Franks, the Magyars, Genoa, the Dubrovnik Republic and so on, dropped out of European development as also did the other Balkan states. This tragic event left a profound imprint on the further history of the people in this country, which, according to Edward Gibbon, had assumed a rank among civilized powers on earth under Tsar Simeon (893–927 AD).

During the 19th century, a process of national revival gained momentum in economic, cultural and political life. Chemistry was introduced in schools in the cities of Stara Zagora (1865), Russe (1871) and Gabrovo (1872). Manuals used were the Russian translation of *Kurzes Lehrbuch der Chemie* by H. Roscoe and C.



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Schorlemmer and two more books: *Agricultural Inorganic and Organic Chemistry* (Russe, 1871) translated from Russian into Bulgarian by D. Enchev, and *Chemistry for Popular Schools* (Vienna, 1872) translated from Serbian into Bulgarian by S. Vezhenov.

Iv. Bogorov, the publisher of the first Bulgarian

newspaper (issued in Leipzig, 1846), was one of the first Bulgarians to study chemistry at the University of Leipzig (1846–47). L. Karavelov, a Bulgarian writer and revolutionary leader, wrote an obituary dedicated to J. Liebig in the journal *Nezavisimost* (Independence; Bucharest, 1873), organ of the Bulgarian Central Revolutionary Committee.

On 3 March 1878, the war Russia fought against Turkey for the liberation of its Bulgarian sister nation ended with the treaty of San Stefano. This was the birth of modern Bulgaria.

1878 to 1944

The first generation of Bulgarian chemists graduated from the universities of Germany, Russia and France, in most cases with doctor's degrees. This small number of highly educated men were employed in secondary schools as teachers or in laboratories as chemists.

The economic development of the young state resulted in the establishment of several laboratories: for example, for analysis of mineral spring water at the Medical Council (1880); for chemical analysis of various goods at the Ministry of Trade and Agriculture (1896); and for control of victuals at Sofia Municipality (1898).

In 1888 the St Clement of Ohrid University of Sofia was inaugurated as Higher Pedagogical Classes (1888) and then as a Higher School (1889–1904). The Chemical Institute at this school and the Chairs of Chemistry at the University were the research and higher educational centres of chemistry in Bulgaria until the end of the Second World War.

The first original scientific paper in chemistry performed in Bulgaria was published by Prof. P. Raikov in 1894 in *Chemiker Zeitung*. It was entitled "Verbesserung an den analytischtitrimetrischen Fällungsmethoden". The participation of Bulgarian scientists in international scientific events began with the Congress* on Applied Chemistry in August 1894 in Brussels. The Bulgarian Chemical Society (nowadays Union of Chemistry and Chemical Industry) contributed to the subscription to monuments of M. Berthelot in France and A. Butlerov in Russia. In 1930, the first doctorate thesis in chemistry was defended at the University of Sofia.

In the years between the two World Wars the first professors and heads of chairs at the University won recognition for their studies. They included:

- P. Raikov (organic chemistry)
- I. N. Stranski (physical chemistry)
- Z. Karaoglanov (analytical chemistry)
- A. Zlatarov (biochemistry)
- D. Ivanov (organic chemistry)
- A. Spassov (biochemistry)

The younger among them and their successors (R. Kaischew, physical chemistry, and N. Penchev, analytical chemistry) as well as their assistants, formed

the main body which, after 1944, rapidly developed in three directions: research work, higher education and industry.

This second generation of Bulgarian chemists, although few in number, attained excellent results comparable to those achieved in more advanced European countries. This was helped by the fact that the University enabled Bulgarian chemists to specialize with scientists such as J. Wislicenus, V. Grignard, W. Kossel and G. Tamman.

For example, Raikov (who held the Chair of Organic Chemistry at the University of Sofia) investigated the mechanism of assimilation of CO₂ by plants and oxidation reactions involving molecular oxygen. Ivanov introduced polyfunctional organomagnesium and organolithium reagents into organic synthesis. These are known today as "Ivanov reagents".

In 1925 the Chair of Analytical Chemistry at Sofia was established. It was one of the first in Europe. Here, Karaoglanov developed original concepts about precipitate impurities and the mechanism of precipitation processes based on extensive studies of barium sulphate. His successor, Penchev, worked on the geochemistry of neon and gravimetric methods for the determination of aluminium, chromium and strontium.

In the same year the Chair of Physical Chemistry at Sofia was also founded. Stranski and Kaischew performed fundamental studies on the molecular kinetic theory of nucleation and crystal growth. In the Chair of Inorganic Chemistry Balarev investigated the so-called real crystalline systems and concluded that their impurities depend not only on the composition of the mother liquid but also on their dispersion. He called this phenomenon internal adsorption.

In the medical faculty of the University, which was founded in 1918, additional courses in physiological chemistry and biochemistry were introduced. The first lecturers were Russians: Profs V. V. Zavyalov (1873–1930), A. K. Medvedev (1863–1921) and A. Cherevkov (1860–1926). They were succeeded by A. Zlatarov, originator of biochemistry and nutrition science in Bulgaria. He investigated the composition, nutritional and calorific values and preparation and application of foods most used by Bulgarians. He discovered a specific and very sensitive reaction for nitrite ions. Zlatarov died in 1936 in Vienna, one year after he was elected to the Chair of Organic Chemistry. Spassov developed new methods for acylating hydroxyl groups and synthesized some biologically active substances.

The work of Rankov on the chemistry and technology of fats is also worth noting. The investigations in the field of chemical technology were hindered by restricted industrial production in the country. In 1939 chemical industry represented 1.6% of the gross industrial output, which, for its part, was small enough. Insufficient amounts of oils, soap, paper, ceramics, matches, glass, cement, some mineral salts and essential oils were produced. The enterprises were small, the equipment and technology, primitive.

For this reason, only a small number of well-trained chemists were needed. From 1919 to 1944, 884 persons studied chemistry at the University of Sofia. However,

*The first in the series of International Congresses which later came under the jurisdiction of IUPAC.

only 206 of them took a diploma. Chemical engineers could only receive training abroad.

From 1944 to the present day

On 9 September 1944 Bulgaria made a fresh start. The socialist reorganization changed the country politically, economically and culturally. The urge for making up five centuries lost in bondage and for taking a worthy place among other nations belongs to the durable phenomena in Bulgarian national life. Under the altered political and social conditions and with the aid of a central planning system, this urge is now being

'An unprecedented development of productive forces, education, science and culture is now occurring in Bulgaria.'

materialized. An unprecedented development of productive forces, education, science and culture is now occurring in Bulgaria. Bulgarians, with their characteristic common sense and sense of proportion, are usually reserved in making assessments; nevertheless, they are proud of the advancement of their country during the last 40 years.

The beginnings of modern chemical industry were laid in the 1950's when chemical plants for the production of sulfuric acid, ammonia, nitrogen and phosphate fertilizers, sodium carbonate and antibiotics became operational in Dimitrovgrad, Devnya and Razgrad.

In the following decade, petrochemical works were built to provide motor fuel and produce:

- Olefines
- Aromatics
- High and low density polyethylene
- Polystyrene
- Butadiene-styrene rubber
- Acrylonitrile
- Polycrylonitrile fibres

In addition, polyester fibres were produced at Yambol, polyamide fibres and pneumatic tyres at Vidin, urea from natural gas at Vratsa, chlorine, caustic soda and polyvinylchloride at Devnya and nitrogen fertilizers at Stara Zagora.

During the 1970s a second petrochemical complex came into operation at Pleven, as well as soda ash and fertilizer factories at Devnya and a synthetic fibres combine at Svishtov. Paint and lacquer factories at Russe, Sofia, and plants for the production of pharmaceutical perfumes and cosmetics were extended and modernized at Razgrad, Sofia and Stanke Dimitrov. The gas pipe line from USSR ensured valuable raw material for the chemical industry and the modernization of other industries.

The rate of development of the Bulgarian chemical industry has exceeded other industries by 30–40%. The industry employs 3% of the country's labour force and controls 9.5% of industrial fixed assets. In 1983 it

accounted for 17.1% of the country's industrial production and earned 25.7% of the total profit made by industry in Bulgaria.

At present, chemical production in Bulgaria meets local market needs. Some 15% of the production is exported. Bulgaria exports more than 180 basic chemical products to more than 80 countries. This constitutes 12% of the country's total exports. Exported chemical products include:

- nitrogen fertilizers
- acrylonitrile
- carbon disulfide
- plastics and synthetic fibres
- synthetic dyestuffs
- plant protection chemicals
- pharmaceutical perfumery and cosmetic products
- technical rubber products

Bulgaria ranks first in the world in per capita production and export of soda ash. This leap forward in industry is inseparable from the collaboration between the countries participating in the Council for Mutual Economic Aid (COMECON). More than 70% of chemical production comes from enterprises built with the technical assistance of the Soviet Union.

Chemical research, education and training

Bulgarian chemical industry is closely connected with the chemical research work being done in this country. It uses results obtained in scientific investigations and is also a source of new projects. In this respect, industry relies not only on the Bulgarian Academy of Sciences and the Higher Educational Institutions but also on its own research and development units. These include 81 scientific institutes, 2 laboratories and 38 research and development departments including:

- Central Institute for Chemical Industry
- Central Laboratory of Automation
- Chemicals and Pharmaceuticals Research and Development Institute
- Centre for Accelerated Launching into Production of Construction Plastics
- Biogenetic Stimulation Agents Centre



Surface studies with an ESCALAB II electron spectrometer at the Institute of General and Inorganic Chemistry.



Kinetic studies of metallic glasses using differential scanning calorimetry in one of the laboratories of the Faculty of Chemistry, University of Sofia.

Petrochemical and Oil Processing Institute
Institute for Speciality Chemical Products and
Veterinary Substances and Medicine Synthesis
Institute

Higher education in chemistry in Bulgaria has developed in response to the need for chemical engineers and chemists with various specializations. These specialists are required in new chemical enterprises and their laboratories, research institutes, technical schools (which train specialists for industry) and in secondary schools and higher educational institutes.

In 1945 the Higher State Technical School (founded in 1942 in Sofia) was renamed State Polytechnical Institute and a Department of Industrial Chemistry was established in its Faculty of Machine-Building. Eight years later the State Polytechnical Institute was divided into four separate institutes. One of these is the Higher Institute of Chemical Technology, Sofia, which now has three faculties:

Organic Technology
Inorganic Technology
Metallurgy

The Institute has 30 Chairs and 2000 students a year and is one of the biggest research centres of chemistry and chemical technology in Bulgaria.

The following investigations have all been carried out at the Institute:

Professor	Chair	Investigation
St G. Christov	Physical chemistry	Quantum electrochemistry and electron emission
D. Elenkov	Chemical engineering	Effect of surfactants upon hydrodynamics and mass transfer in industrial units
L. Zhelyazkov	Organic synthesis	Synthesis of pharmaceuticals

The results obtained have favourably influenced the production of synthetic fertilizers, glass and fine ceramics, special polymers, synthetic fibres, plant protection preparations, pulp and paper.

In 1963, the Professor Dr A. Zlatarov Higher

Institute of Chemical Technology was founded in Bourgas. At present it has 20 chairs and trains about 1000 students a year, 10% of whom are foreigners. Research at the institute is mainly concerned with problems of the petrochemical industry, technology of water and membrane processes, and synthesis of inorganic materials for electronics.

Since 1953 there has also been a Higher Institute for Food Industry with two faculties having 20 chairs in Plovdiv. About 8000 engineers have been trained in this institute, including 450 citizens of 23 other countries. The chemical investigations here are directed at technological problems in obtaining nutritional products from vegetables and animals and also at microbiological and fermentation processes.

The Paissy of Khilander University at Plovdiv was established in 1961 as the Higher Pedagogical Institute. It has three faculties. Most chemistry students are trained for teaching in secondary schools. There are five chairs in chemistry. Research is currently being carried out on the development of new analytical methods for application to non-ferrous metallurgy, on the preparation of synthetic and natural biologically active substances in the technology of lipid preparation and on electrocatalysis.

In 1971 the Higher Pedagogical Institute in Shoumen, founded as a faculty of the University of Sofia, was detached as an independent institute. It trains secondary school teachers in the natural sciences, Bulgarian and Russian. In the chemistry department investigations are being undertaken on coordination



An experiment in the laboratory of organic electrochemistry of the Higher Institute of Chemical Technology, Sofia.

The main building of the University of Sofia.



compounds, polymers, organic luminophors, colloid chemistry and metal catalysts.

There are also specialized chairs in chemistry at the Academy of Medical Sciences, the Academy of Agriculture, and the remaining Higher Technical Institutes, such as the Institute of Mechanical and Electrical Engineering and the Institute of Forestry.

The St Clement of Ohrid University of Sofia has played an important role in the post-war development of chemistry in Bulgaria. In 1961, the chairs of chemistry of the Physico-Mathematical Faculty were detached as an independent department, which now has 7 chairs, 14 professors, 28 docents and 92 assistants. In 1940, the numbers were 6, 5, 2 and 11, respectively. During the decade of chemistry (1961–72), about 350–400 persons graduated from this department each year.

The Faculty of Chemistry has maintained high standards in research and learning. Some of the most eminent Bulgarian chemists work here. Their studies on organic synthesis, thin liquid films, adsorption, catalysis, coordination compounds, materials science and so on define, to a large extent, the state of modern Bulgarian chemistry. Even more important has been the ability of the faculty to produce top quality scientists. The first chairs in chemistry at the higher educational institutions were all occupied by graduates of the Faculty.

Bulgarian Academy of Sciences

The Bulgarian Academy of Sciences — IUPAC's National Adhering Organization (NAO) in Bulgaria — was originally the Bulgarian Literary Society. Until 1947 the rank "Member of the Academy" was an honorary title only presented to scientists in recognition of outstanding work. The Academy had no institutes and laboratories of its own. In 1947, Rankov, a Corresponding Member of the Academy, was en-

trusted with the organization of a Chemical Institute at the Bulgarian Academy of Sciences. However, little happened for several years, although by 1953 the institute already had rooms and staff.

In 1958 the Institute of Physical Chemistry was detached from the Physical Institute of the Academy. Its Director was Acad. R. A. Kaischew. Two years later, the Chemical Institute was divided into the Institute of Organic Chemistry (Director Acad. B. J. Kurtev) and the Institute of General and Inorganic Chemistry (Director Acad. G. M. Bliznakov). These three institutes were combined as the Department of Chemical Sciences in 1961. In 1972 the Department was integrated with the Faculty of Chemistry under the name Centre for Chemistry. Its Director was Acad. Kurtev. Additional sections were also formed. These included the Central Laboratories of:

- Electrochemical Power Sources (1967, Director E. Budevski, Corr. Member of the Academy)
- Photographic Processes (1967, Director J. Malinovski, Corr. Member of the Academy)
- Chemical Engineering (1972, Director D. Elenkov, Corr. Member of the Academy)
- Polymers (1972, Director Prof. M. Mikhailov)
- Institute of Kinetics and Catalysis (1984, Director Acad. D. Shopov)

The Centre for Chemistry undertakes both basic and applied research, the results of which aim to contribute to the advancement of chemical knowledge, progress of the national economy and the training of specialists with a view to the future needs of the country.

It is not easy to establish an equilibrium between problems originating from the logical development of science, those associated with the requirements of society and those which might need to be faced in future especially in a land of area 111 000 km² and a population of 9 millions.

However, the centre has already some experience in this respect. The results in the field of physical organic

chemistry are interrelated with those of natural and synthesized biologically active substances and polymers. The achievements in the field of phase formation are the basis for the development of investigations on the electrocrystallization of metals, on corrosion and on lead batteries. The electronic properties of solids are studied in connection with the creation of new photographic materials, catalysts and so on. Finally, the understanding of the action of surfactants and the kinetics of rupture of thin liquid films has resulted in the perfection of industrial mass transfer equipment and flotation processes, for example.

Conclusion

Starting from nothing some 100 years ago, chemistry in Bulgaria has advanced rapidly especially over the last

30 years. Such progress has inevitably created problems. In some cases quality has been sacrificed for quantity. An example is environmental protection which has been relatively neglected in favour of increasing the production of metals, fertilizers and paper. However, Bulgarian society is now becoming more aware of these problems and, of course, chemistry can greatly help to solve them.

When he became Rector of the University of Sofia in 1908, Prof. Raikov said "The day is not far distant when the wealth and prosperity of a people will be judged not by the magnitude of the land and its natural resources but by the degree of conscious cultivation of chemistry".

These words are appropriate for Bulgarians today.

Commission & Committee News

Determination of erythrodiol

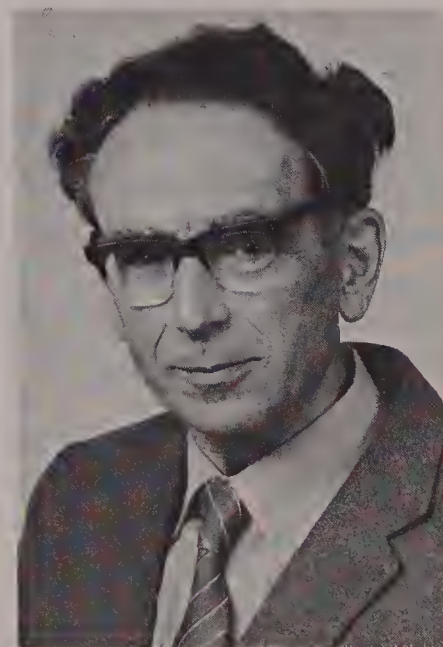
Erythrodiol is a triterpenoid glycol (also known as homo-olestranol) first identified as a component of olive-residue oil by Gracian and Martel¹. The unsaponifiable matter of olive-residue oils contains up to 20 per cent erythrodiol. The glycol also occurs in grapeseed oil at a level of about 1.5 per cent (expressed as a percentage by mass of the oil). Since it occurs in significantly less amounts in vegetable oils than olive-residue oil and grapeseed oil, erythrodiol has been adopted as:

- (a) an identity characteristic of grapeseed oil, and
- (b) an indicator of adulteration of genuine olive oils by olive-residue oil.

The recommended Codex Alimentarius Commission standard² for edible grapeseed oil cites a minimum erythrodiol content of 2 per cent of the total sterols in the oil. Italian legislation³ limits the permissible level of erythrodiol in olive oils to a maximum of 5 per cent of the total sterols, a content of greater than 5 per cent being taken to indicate the presence of olive-residue oil. The Customs Union Services of the European Economic Commission is at present considering a proposal to introduce an erythrodiol criterion in the regulations concerned with the tariff classification of olive oils.

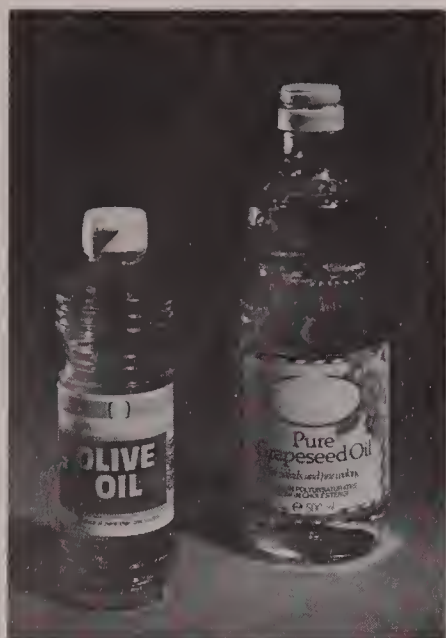
For these reasons the need has arisen for an internationally accepted standard method for the determination of erythrodiol and the IUPAC Commission on Oils, Fats and Derivatives (VI.3)

W. Dennis Pocklington, Secretary of the Commission on Oils, Fats and Derivatives.



was accordingly requested to undertake the required analytical work to develop a standard method. Following this request, Commission VI.3 set up a working group in 1980 and three studies were carried out from 1981 to 1983 on a method that had been used for some time by one national administration. Samples of olive-residue oils, grapeseed oils and blends of olive oil with olive-residue oils were distributed for the studies in which eight laboratories from five countries (France, Italy, Japan, Spain and the United Kingdom) took part.

The method studied is based on a preliminary



Erythrodiol occurs in olive residue oil and grapeseed oil.

TLC separation of the unsaponifiable matter of the oil, followed by gas-liquid chromatography of the combined sterol and triterpenoid glycol fraction after silanization. The use of an internal standard (betulin) allows the erythrodiol content to be expressed as a percentage by mass of the oil.

Teaching of Clinical Chemistry

The Commission on Teaching of Clinical Chemistry met in Copenhagen, Denmark, 11–17 May 1986. This constituted the main annual meeting of the Commission for 1986 at which progress reports of its projects were presented and future activities discussed.

The meeting was held as part of the 2nd International Federation of Clinical Chemistry (IFCC) Conference. As the IUPAC Commission on Teaching of Clinical Chemistry also forms the IFCC Education Committee it was important, indeed a requirement, that the Commission should hold its meeting as part of this conference in order to discuss its work with other IFCC bodies and committees. In this context the Commission held joint meetings with the IFCC Executive Board, the Scientific Committee, the Publications Committee, and Expert Panels on Instrumentation, Reagent Sets, Quantities and Units, Apolipoproteins and Drug Effects.

Since the last meeting at the IUPAC General Assembly, August, 1985, three projects have been completed in the sense that they have resulted in publication namely, Guidelines (1985) for Teaching of Clinical Chemistry to Medical Students, *J. Clin. Chem. Clin. Biochem.*, Vol. 23, pp. 697–703 (1985), Guidelines (1985) for Clinical Chemists for Effective Communication of Clinical Chemistry Laboratory Data, *J. Clin. Chem. Clin. Biochem.*, Vol. 23, pp. 891–897 (1985) and Definition of the Terms Certification, Licensure and Accreditation in Clinical Chemistry, *J. Clin. Chem. Clin. Biochem.*, Vol.

Alternatively, the content may be expressed relative to the beta-sitosterol content of the oil.

The standard method (2.431) for the determination of erythrodiol has been published in *PAC*⁴ together with a report on the collaborative study. The method will be included in the first supplement to the 7th edition (1986) of the IUPAC Standard Methods for the Analysis of Oils, Fats and Derivatives which enjoys international recognition as the standard work on oils and fats analysis.

W. Dennis Pocklington

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4. *PAC*, **58**(7), 1023–1034 (1986).

23, pp. 899–901 (1985).

Work on the educational aspects of Drug Effects in Clinical Chemistry which has been carried out jointly with the IFCC Expert Panel on Drug Effects has progressed slowly, and the Commission agreed with the Expert Panel at their joint meeting that this project should reach a conclusion with a manuscript for submission for publication by the end of 1986.

Of the more recent projects three had resulted in drafts which were discussed at the meeting namely, the Clinical Chemist's Role in Laboratory Safety, Guidelines for the Production of Objective Based Syllabi for Clinical Chemistry and Guidelines for the Preparation of Laboratory Procedure Manuals for Clinical Chemistry. The last of these has been prepared jointly with the IUPAC Commission on Automation and Clinical Chemical Techniques (VII.1) and the IFCC Expert Panel on Instrumentation and has now been agreed by these bodies and submitted for consideration for publication on behalf of IUPAC and IFCC. The other two documents are now being re-drafted as a result of discussion at the meeting and will be re-submitted to the next meeting of the Commission for consideration for publication.

The outline of a further project, Syllabus for Clinical Chemistry Training and Laboratory Management was agreed and it is hoped a manuscript will be submitted for consideration at the next meeting.

In addition to these projects the Commission has

been considering a draft document on recommendations for the conversion to SI Units for those countries which have not already undertaken this. This has been done in close cooperation with the Commission on Quantities and Units (VII.2). Such a document was considered timely as Clinical Chemists in the US are proposing to change to SI Units during 1988.

The next meeting of the Commission is scheduled to take place in Cartagena, Colombia as part of

the Latin American Congress of Clinical Biochemistry in October, 1986, where the members of the Commission will be making a major contribution to a Symposium on Education in Clinical Chemistry. Immediately following this meeting they will take part in an advanced training course in Mexico City as part of the IFCC Mexico Clinical Chemistry Project.

H. G. J. Worth

Provisional Recommendations

IUPAC seeks your comments

All comments on these recommendations are welcome and will be taken into consideration. The final revised versions are published in *Pure and Applied Chemistry* and synopses of these published in *CI* as recent reports. If you would like to comment on the provisional recommendations please write to your nearest regional centre requesting a copy of the full report. Copies are not available from the Secretariat. The most up-to-date list of regional centres appeared in *CI*, Vol. 8, No 3. p 28 (1986).

Chiroptical techniques, nomenclature, symbols, units

The three most important chiroptical phenomena in absorption spectroscopy are Optical Rotatory Dispersion (ORD), Circular Dichroism (CD), and the development of Ellipticity in an optically active medium. The document cites relevant bibliography in this area, summarizes the basic definitions and conventions (Chiroptical Techniques, Linearly polarized Light, Circularly polarized Light, Elliptical polarized Light, Optical Rotation, Circular Dichroism, Ellipticity, COTTON effect) and presents a list of symbols, units (both SI and customary) and dimensions together with their definitions (Circular Birefringence, Angle of Optical Rotation, Specific Rotation, Molar Rotation, Amplitude a of a COTTON effect, Differential Absorbance, Circular Dichroism, Ellipticity, Specific Ellipticity, Molar Ellipticity, Rotational Strength, Reduced Rotational Strength, g-Numbers) for low-molecular weight

compounds, as well as special conventions for polymers. Quantitative correlations between the three mentioned phenomena are given, and a pentalingual dictionary (English, French, German, Japanese, Russian) of the frequently used terms has been added. Older definitions and terms have been included for convenience, but their use is no longer recommended. Four figures should help to explain some of the definitions. Magneto-optical effects (MORD, MCD), CD in emission, and IR-CD are not covered.

Comments on the report are welcome and should be sent before 30 June 1987 to Prof. Günther Snatzke, Lehrstuhl für Strukturchemie, Abteilung für Chemie, Ruhr-Universität Bochum, Postfach 102148, D-4630 Bochum 1, Federal Republic of Germany.

Recommendations for the presentation of papers for publication in luminescence spectroscopy

This report is a sequel to the one published earlier on Nomenclature in Molecular Luminescence Spectroscopy (*PAC*, Vol. 53, pp. 1953–1966, 1981). It is divided into two parts: (A) terms to be employed in Papers Presenting Data on Photoluminescence; and (B) Information and Data Presentation. The report is intended as a guide to

ensure uniformity in presentation of results in the area of luminescence.

Comments on the report are welcome and should be sent before 30 June 1987 to Prof. George G. Guibault, Chemistry Department, University of New Orleans, Louisiana 70148, USA.

In this section we publish summaries of the most recent IUPAC Recommendations on Nomenclature and Symbols and Technical Reports. The full texts of these recommendations and reports are published in *PAC*.

Recommendations for the presentation of thermodynamic and related data in biology (Recommendations 1985)

Thermodynamic data are important in describing and in developing an understanding of biological systems. However, at present there is a marked variation in the terminology and symbols used in this connection. A guide has been prepared in which SI units and symbols of special importance for biothermodynamics are summarized together with examples and with comments concerning their use. It is recognized that in some cases recommendations made by IUPAC may have to be adjusted slightly or developed further in order to suit the practical needs in the biological sciences. In the present report suggestions are given with this purpose in mind.

The overall aim of the report has been to prepare a document which will serve as a practically useful guide for those who are involved in scientific writing and in teaching in the field of biothermodynamics. The document is therefore intended to be largely self-contained.

This report was prepared by the IUPAC and IUB (International Union of Biochemistry) Interunion Commission on Biothermodynamics and was published in PAC, Vol. 58, No. 10, pp. 1405–1410, 1986. A synopsis of this report was published as Provisional Recommendations in CI, Vol. 7, No. 4, p. 37, 1985. These Provisional Recommendations were sent to national/regional centres for distribution to interested chemists. Comments on the recommendations received before the end of March 1986 were taken into consideration when preparing the final recommendations.

Recommended methods for the purification of solvents and tests for impurities: 1-propanol, 2-propanol, and 2-methyl-2-propanol

Specifications for commercially available solvents, the relevant physicochemical properties, and key solvent properties are given for the three water-soluble 3- and 4-carbon alcohols. The procedures for their purification include the removal of water

and of organic contaminants. Methods for the determination of these and of metal impurities in the alcohols are presented.

This report was prepared by the Commission on Electroanalytical Chemistry (V.5) and published in PAC, Vol. 58, No. 10, pp. 1411–1418, 1986.

Determination of butyric acid in fats containing butterfat: results of a collaborative study and the standardised method

The development, by collaborative study, of a standardised method for the determination of the butyric acid content of butterfat and fats containing butterfat is described. The procedure involves saponification of the fat, liberation of the butyric acid by phosphoric acid and determination of the free butyric acid by gas-liquid chromatography in the presence of an internal standard.

This report was prepared by the Commission on Oils, Fats and Derivatives (VI.3) and published in PAC, Vol. 58, No. 10, pp. 1419–1428, 1986.

Recommended methods for the purification of solvents and tests for impurities: acetone

Values are given for the most relevant physicochemical properties and solvation parameters of acetone. The most significant solvent properties of acetone, particularly the limitations imposed by aldol condensation, are discussed. Typical examples of electrochemical studies carried out in this solvent are listed. Methods are recommended for the purification of commercial acetone and for the determination of residual water and other impurities.

This report was prepared by the Commission on Electroanalytical Chemistry (V.5) and published in PAC, Vol. 58, No. 11, pp. 1535–1540, 1986.

Recommended methods for the purification of solvents and tests for impurities: nitromethane

The most significant solvent properties of nitromethane are discussed. Values are tabulated for its most relevant physicochemical properties and of

its solvation parameters. Examples are given of typical electrochemical studies carried out in this solvent. Impurities present in commercial nitromethane are listed, and a recommended purification procedure is described. Precautions dictated

by the potential explosion hazard of nitromethane are discussed.

This report was prepared by the Commission on Electroanalytical Chemistry (V.5) and published in PAC, Vol. 58, No. 11, pp. 1541–1545, 1986.

Publications

Environmental consequences of nuclear war

The climatic changes which could result from a major nuclear conflict would affect combatant and non-combatant nations alike. This and other long-term environmental consequences of nuclear war have been at the centre of the continuing nuclear debate in recent years.

In 1983 the Scientific Committee on Problems of the Environment (SCOPE) initiated a study on the environmental consequences of nuclear war (ENUWAR) at the request of the International Council of Scientific Unions (ICSU). A Steering Committee charged by SCOPE with responsibility for the review recruited scientists from more than 30 countries. These specialists participated through correspondence and in workshops held in London, Stockholm, New Delhi, Leningrad, Tallinn, Paris, Delft, Hiroshima and Tokyo, Toronto, Melbourne, Caracas and Colchester.

The effort was made possible by the voluntary contribution of time and thought by more than 300 scientists and by financial aid from their institu-

tions and from the Carnegie Corporation, the General Service Foundation, the Andrew W. Mellon Foundation, the Rockefeller Brothers Fund, the W. Alton Jones Foundation, the Royal Society of London, the Academy of Sciences of the USSR, the Australian Academy of Sciences, the Indian National Academy of Sciences, Maison de la Chimie (Paris), the Royal Swedish Academy of Sciences, the Royal Society of New Zealand and the United Nations University.

Recognizing the uncertainties attached to estimates of the effects of a major nuclear conflict on a scale without precedent, the Steering Committee nevertheless concluded that many of the serious global environmental effects are sufficiently probable to require widespread consideration. Any disposition to minimize or ignore those effects and the possibility of a tragedy of unprecedented dimensions would be a fundamental disservice to the future of global civilization.

SCOPE Report 28: Environmental Consequences of Nuclear War

Volume I — Physical and Atmospheric Effects

Volume II — Ecological and Agricultural Effects

This two volume book is the most comprehensive and interdisciplinary appraisal to date of the state of scientific knowledge of the possible environmental consequences of nuclear war. It presents a consensus among leading members of the international scientific community as to the effects nuclear detonations, and particularly a major nuclear exchange, might have on climate, ecosystems and food supply. Sponsored by ICSU, and drawing upon findings from the workshops mentioned above, the authors assess the likely magnitude of changes in sunlight, temperature, precipitation, atmospheric chemistry, ionizing radiation, ultraviolet radiation, plant and animal growth, and resultant agricultural productivity.

Volume I reviews the present nuclear arsenals; selected nuclear war scenarios; the immediate impacts of detonations, including blast, thermal,

ionizing radiation, fire and electromagnetic pulse; sources of smoke, dust, and chemicals; physical processes in the atmosphere interacting with the injected aerosols and gases; meteorological and climatic effects; changes in the atmospheric chemistry of the troposphere and stratosphere; radiological doses from local and global fallout, and research needs.

Volume II reviews ecosystem structure and function relevant to nuclear war effects; plant and animal responses to the subsequent recovery from climatic stresses; responses to other nuclear war effects including UVB, and ionizing radiation; the effects of nuclear war stresses on agricultural productivity; an estimate of the vulnerability of world food production and storage to nuclear war disruption; the estimated population possibly affected; and research needs.

This volume will be of interest to research workers, teachers and students in agronomy, botany, biology, climatology, ecology, environmental science, forestry, geography, meteorology,

plant physiology, radiobiology, and political science as well as to analysts of armament, military, and foreign policy.

Volume I by A. Barrie Pittock, Thomas P. Ackermann, Paul J. Crutzen, Michael C. MacCracken, Charles S. Shapiro and Richard P. Turco is published by John Wiley & Sons Limited, Chichester, UK, 1986. xi + 359 pp. ISBN 0 471 909181. Price £35.00/US-\$ 57.75.

Volume II by Mark A. Harwell and Thomas C. Hutchinson is also published by John Wiley & Sons Limited, 1985. xxxviii + 523 pp. ISBN 0471 90898 3. Price £43.50/US-\$ 73.00.

Planet Earth in Jeopardy

This book is based on the 2-volume book entitled *The Environmental Consequences of Nuclear War: I. Physical and Atmospheric Effects; and II. Ecological and Agricultural Effects*, published by John Wiley and Sons (see above). The author of this volume, Lydia Dotto, was commissioned by SCOPE to write a popular account of the larger study, the objective being to reach the widest possible audience.

The book is intended to provide an overview of the two larger and more detailed scientific volumes and is necessarily written in a much less technical style for the benefit of lay readers. Thus, it is not possible to include all of the detailed chains of reasoning, subtleties of emphasis and shadings of meaning that are contained in the 2-volume report.

The book is published by John Wiley & Sons Limited, 1986. vii + 134 pp. ISBN 0 471 90908 4 (pbk.) 0 471 99836 2 (Cloth). Price £4.95 (pbk.) US-\$8.70 (Cloth).

Innovative approaches in drug research

This book contains the proceedings on the third series in the Noordwijkerhout Symposia on Medicinal Chemistry organized by the Medicinal Chemistry Division of the Royal Netherlands Chemical Society (KNCV). The major aim of the series is to intensify the dialogue between the two groups of scientists active in the field of medicinal chemistry: the chemists including the (Q)SAR-ists, and those who work mainly on biological aspects.

The third symposium — on innovative approaches in drug research was held in the Congress Centre, Leeuwenhorst in Noordwijkerhout, the Netherlands 3–6 September, 1985. About 300 participants from over 20 countries attended the symposium. The scientific programme included the following subjects: receptors and preliminary

screening in drug development; drugs and macromolecules, structures and modelling; new developments in chemotherapy and natural products and medicinal chemistry.

These proceedings provide the complete texts of all main lectures given at the symposium and its satellite sessions.

The book is edited by A. F. Harms and published by Elsevier Science Publishers B.V., 1986. vi + 481 pp. ISBN 0 444 42606 X. Price US-\$90.75/DFI 245.00.

Applications of the Mössbauer Effect

These three volumes of *Hyperfine Interactions* were edited by R. Coussemment and G. Langouche, and contain the proceedings of the International Conference on the Applications of the Mössbauer Effect (ICAME 1985) held at the University of Leuven, Belgium, 16–20 September, 1985.

More than 20 invited lectures contributed to the scientific programme of the ICAME 1985 conference. Their talks were devoted to the most recent developments in Mössbauer Spectroscopy — including the expanding field of amorphous materials. There were also lectures on Mössbauer diffraction and the recent experimental success in the use of synchrotron radiation in Mössbauer Spectroscopy.

The three volumes are published by J. C. Baltzer AG, Scientific Publishing Company, Basel, Switzerland, 1986. xxxii + 1656 pp. ISBN 3 905 135 05 1. Price Sw.fr. 880.80.

Science and Public Affairs

Science and Public Affairs, edited by Sir Alec Merrison, is a new annual publication by the Royal Society, UK, dealing with the wider implications of science and technology in government, industry, commerce and daily life. The first issue was published in May 1986.

Science — in medicine, in environmental protection, in 'new technologies' and in increasingly technologically sophisticated consumer goods, for instance — is having a major impact on all our lives and, in relatively short periods of time, is bringing about quite dramatic changes in life at school, at work, or in the home. The need for decision-makers in central or local government, or in industry, fully to understand and to take into account scientific and technological aspects of public policy on, for example, health care provision, energy consumption, agriculture production, etc. has correspondingly increased. Both the potential benefits from science and technology and the commercial risks and uncertainties need to be adequately appreci-

ated for a balanced decision — at a corporate or an individual level — to be made. Public response to many such issues — through the media for example — shows the growing degree of interaction between science and the public. The Royal Society intends that *Science and Public Affairs* will contribute to this interaction by presenting and promoting discussion on such matters.

The Community of Science

"There are few communities so united in a common purpose as to the community of science. Our differences — in politics, in religion, even in our allegiance to a particular branch of science — may be great but we are united in a deep love and admiration of science as a whole, and a reverence for the immortal discoverers of the past. Likewise we feel a close affinity with our colleagues in similar societies abroad with whom we have always maintained the closest possible contact, even in times of war and political persecution. To most of us, the pursuit of truth, the improvement of natural knowledge, transcend all national and political boundaries." Sir George Porter, President,

The Royal Society in *Royal Society News*, Vol. 3, No. 9, p. 1 (May 1986).

Modern approaches to chemical reaction searching

This book, edited by Peter Willett, contains the proceedings of a conference organized by the Chemical Structure Association at the University of York, UK, 8–11 July 1985. The book provides a comprehensive review of the current state of research and development into computerized systems for the storage and retrieval of information on chemical reactions. This reflects the growing interest shown in the subject, as is illustrated by the development of commercial systems, several of which are described in the text. These papers will interest computer scientists, chemists, information scientists and all who are concerned with the design, implementation and use of chemical information services.

The book is published by Gower Publishing Co. Ltd, Hampshire, UK, 1986. xiv + 266 pp. ISBN 0 566 03550 2. Price £27.50.

Specifications for pesticides used in public health: insecticides, molluscicides, repellents and methods

The task of once again bringing up to date the specifications for pesticides used in public health was undertaken by the WHO Expert Committee on Vector Biology and Control. This new edition continues the WHO policy of keeping analytical methods for pesticides under constant review so as to take advantage of improvements in technology and thereby achieve greater accuracy, sensitivity, specificity, reproducibility, ease of manipulation, and, where possible, economy in the analytical method used.

The most notable difference between the sixth edition of this standard work and its predecessors is that, where applicable, modern techniques such as gas-liquid chromatography and high-performance liquid chromatography have been introduced in place of older analytical techniques. The Expert Committee realized the difficulties faced by developing countries in the acquisition and maintenance of modern equipment, but considered that the greater reliability of the new techniques made it imperative that they should be adopted. Moreover, they conform to the analytical procedures adopted by the Food and Agriculture Organization of the United Nations (for agricultural pesticides), the Collaborative International Pesticide Analytical Council (CIPAC), and the Association of Official Analytical Chemists (AOAC).

In addition to these changes, this edition includes specifications for new pesticides and for new formulations of older compounds currently being used to control disease vectors. Some compounds that are no longer used in public health have been deleted.

The specifications are designed to meet the requirements of public health programmes, which differ in many respects from the requirements of agriculture, notably in the physical properties of the formulations and in the content of the active ingredient. However, the specifications for technical products, which define the material to be used in the formulations, are of broader application. Indeed, in selecting analytical methods for inclusion in these specifications, one of the guiding principles was that they should be acceptable alike to the manufacturer, the public health worker, and the agricultural user.

The sixth edition of these specifications is published by WHO, Geneva, Switzerland, 1985. 384 pp. ISBN 92 4 156084 3. Price Sw.fr. 48.-. French and Spanish editions are in preparation.

Regulations of Pharmaceuticals in Developing Countries. Legal Issues and Approaches

In today's market, with its steady stream of "new" drugs — many of which are merely copies of existing formulations — it is vitally important that governments establish and implement appropriate policies to control the manufacture, importation, distribution and use of pharmaceuticals. This need is now being recognized by many developing countries, where limited resources mean that high priority is accorded to the provision of appropriate, safe, and effective drugs at a reasonable price. A first step in developing a suitable regulatory mechanism is the setting up of a legal framework that takes into account not only policy objectives in the health sector, but also the existing administrative, social, economic, and health needs and conditions in the country.

In simple and non-technical language, this book provides a much-needed introduction to some of the more important legal issues concerned with

regulation of pharmaceuticals in developing countries and describes some possible approaches to establishing a manageable regulatory framework. Despite the complexity of the subject, the approaches described go a long way towards demystifying and simplifying the process of formulating regulatory measures. Consideration is also given to the administrative and operational mechanisms needed to translate the laws into action.

To assist policy makers and administrators charged with establishing and managing control systems, the book draws on the experience and laws of a number of developing countries to show what can be done with limited resources. These examples provide a solid starting point for adaptation to conditions in other countries.

This book by D. C. Jayasuriya is published by WHO, Geneva, 1985. ISBN 92 4 156089 4. 118 pp. Price: Sw.fr. 14.—.

National subscriptions to IUPAC

At the 1983 General Assembly in Lyngby the Council accepted the adoption of a mathematical formula for calculation of national subscriptions to IUPAC in future years. National subscriptions calculated using this formula were published in the Secretary General's column in the August issue of *Chemistry International* (see *CI*, No. 4, pp. 8–11, 1985). Prof. A. Björkman, IUPAC Treasurer, now describes how the national subscriptions were calculated.

IUPAC has a number of expenditures (mainly travel, subsistence, secretariat and bank costs), which are included in the budget, approved by Council. The necessary income is derived mainly from national subscriptions, profit from IUPAC assets, and surplus on publications. The national subscription, which is a minimum figure, may be made up by two integral parts:

1. National Adhering Organization (NAO) payment, obtained from governmental sources, etc.
2. Company Associates (CA) income, paid directly to IUPAC or through the NAOs.

The CA income is determined by a basic unit. Other income from various sources must be estimated. However, these figures are in principle fixed. Hence, the budget must be balanced by the sum of NAO payments (item 1 above).

The size of the minimum national subscription

(NS_i) for country "i" is related to its national chemical turnover (CT_i) by the following formula ($TNS = \sum NS_i$, being the budget figure of total national subscription income):

$$\frac{NS_i}{TNS} = \left(\frac{CT_i}{\sum CT_i} \right)^{0.68}$$

If a country provides no CA income, the minimum NAO payment is, of course, equal to NS_i ; otherwise the CA income is deducted from NS_i to find the minimum NAO payment.

Since the CT_i is the deciding figure, IUPAC obtains data from reliable official sources, based on an IUPAC listing of chemical industries (cf. Leuven, 1981). Nevertheless, an NAO may request correction (down or up) of a recommended CT_i by the presentation of valid arguments. For the handling of such requests the Treasurer may consult a Subscription Advisory Group. The entire matter of NS_i s is discussed regularly in the Finance Committee.

After the CT_i figure is settled an NAO may still ask for a reduced NS_i on special grounds, which may prevail for one or more years. On the other hand, an NAO may elect to pay more than the minimum NS_i , for example, when the CT_i evidently does not represent the industrial chemical activity in a country. An increased NS_i may also be recommended by IUPAC. Final decisions as necessary are

taken by the Officers/Executive Committee.

In exceptional circumstances an NAO may apply to IUPAC in a particular year for permission to

make part payment of its subscription in national currency, provided that this part constitutes payment for approved IUPAC budget costs.

IUPAC Accounts for 1985

Earlier this year, on the recommendation of the Finance Committee, the IUPAC Officers agreed that there should be an annual audit and publication in *CI* of the IUPAC accounts. This audit was duly carried out by Neutra Treuhand AG of Zürich for the 1985 accounts, which are included hereafter. It will, of course, still be necessary (Statute 5.408) for Council at Boston next year to consider and adopt or reject the biennial accounts for 1985–1986.

To most people accounting is an inevitable, dull control mechanism, where the audit is final proof that the management of income, expenditure and assets has been done properly. The figures presented hereafter are fully dependable, but they do not tell much about IUPAC activities other than that these have been continued in 1985.

To some people the statement of accounts may be quite incomprehensible, since the “rules” are not known. However, it must be of interest for everyone to learn whether the IUPAC economy looks healthy and to get some feeling of the use of (and need for) money within the Union.

A few major comments from me may make reading of the accounts easier. In the actual accounts there are also some footnotes referring to specific items.

One principal figure to explain is the considerable excess of income over expenditures of over US-\$224 000, compared with the budgeted excess of US-\$94 000. A detailed examination reveals several main reasons for this deviation between budget and accounts (rounded figures in US-dollars):

- a rise in national subscriptions (26 000), which should be looked upon as formal only (*cf.* below),
- increased surplus on publications (24 000), partly a result of the change of IUPAC official publisher,
- underspending on activities of IUPAC bodies (40 000), the causes being complex but certainly not the effect of overbudgeting,
- lower expenditures (22 000) in terms of US-dollars on the IUPAC Secretariat (disregarding publications and Affiliate Membership Scheme), because of the then continuing high value of the dollar while actual costs are paid in UK-pounds,

- lower expenditure on the Lyon General Assembly (11 000; 3.5% on the budget figure).

Income from national subscriptions is uncertain, because of the inability to pay a specific year or from requests for reductions of subscription with some NAOs, the 1985 outstanding subscriptions amounting to over US-\$95 000. This problem has forced your Treasurer to carry out an extensive correspondence with several member countries.

I am happy to announce that, with a few exceptions, this work has led to agreements, accepted by my fellow Officers. However, my attempts have also failed and Brazil and Venezuela have left the IUPAC family. The prospective loss of income, which has to be written off in the accounts, is estimated by the Finance Committee and entered into the budgets and accounts as “bad debts”.

In the Balance Sheet, “Subscriptions, etc. Outstanding” is an accumulated figure, explained in the footnotes. “Provisions” means money reserved for specific uses and some can be accumulated figures.

For your information, I wish to confirm that the announcement at Lyon to reorganize the budget preparation is under way. Moreover, firm rules are proposed for the management of Supplementary Assets (i.e. assets above the sum of expenditures of the two previous years). These matters will appear next year at the Boston General Assembly.

Finally, I would like to mention that I have decided — in order to reduce confusion — that we should distinguish in future between a **Budget Biennium** like 1986/1987 (for budgets presented to Council in Lyon) and an **Accounting Biennium** like 1985/1986 (the accounts for the two years to be approved by Council in Boston).

Anders Björkman
Treasurer

Notes for 1985 Balance Sheet

(a) A provision made in 1984 for lower market value than cost price.		National Organizations (1985)	
		Australia	3 200
		Austria	4 200
		Belgium	10 750
		Bulgaria	1 100
		Cuba	600
		GDR	10 000
		Hungary	5 000
		Iraq	2 500
		Japan	30 200
		Poland	7 700
		Portugal	1 700
		Spain	12 050
		Syria	1 250
		Turkey	2 500
		Yugoslavia	2 500
			<u>95 250.00</u>
			124 814.50
		Services Charges Comp. Assoc. (1985)	
		UK	650
		USA	<u>50</u>
			700.00
		Service Charges Obs. Countries (1985)	
		Pakistan	<u>50.00</u>
			125 564.50
		(d) <i>Transitory Liabilities</i>	
		Payment Chile	650.00
		Advance Payment Argentina	<u>600.00</u>
			1 250.00

Statement of General Income and Expenditure for Year ended 31 December 1985 (expressed in US dollars)

Expenditure		Income	
<i>Office Expenses</i>		<i>National Subscriptions</i>	
IUPAC Officers	4 644.00	Received	360 490.29
IUPAC Secretariat (non-publ.)	114 008.00	Outstanding	95 250.00
Audit, Bank Fees, Other Charges	20 469.75		455 740.29
	139 121.75		
<i>Expenses IUPAC Bodies</i>		<i>Company Associates Service Charges</i>	
Administration Expenses	18 375.83	Received	4 825.00
Meetings other than Gen. Assembly	44 478.50	Outstanding	700.00
General Assembly	279 323.66		5 525.00
	342 177.99		
<i>Bad Debts Write Off</i>		<i>Observer Countries Service Charges</i>	
	83 022.00	Received	600.00
		Outstanding	50.00
			650.00
<i>Provisions Made</i>		<i>Interests and Dividends Earned</i>	
Committed Expenditure ^a	5 964.00		107 764.50
Bad Debts ^b	40 000.00		
CHEMRAWN Rolling Fund ^c	5 073.54		23 517.00
Compendium IUPAC Terminology	7 843.00		
Affiliate Activities ^d	11 911.22		96 377.65
	70 791.76		
<i>Other Expenses</i>		<i>Withdrawals from Provisions</i>	
Free Chem. Intl. & Membership Lists	24 580.24	Committed Expenditure ^e	106 000.00
Compendium IUPAC Terminology	1 958.00	Bad debts ^b	83 022.00
Affiliate Membership Scheme ^d	21 445.00	UNESCO Contracts	1 300.00
CHEMRAWN Rolling Fund	331.00		190 322.00
UNESCO Contracts	8 300.00		
Contributions to ICSU	10 902.48		4 047.71
	67 516.72		
<i>Excess of Income over Expenditure</i>		<i>Other Income</i>	
	224 270.97	CHEMRAWN Rolling Fund ^c	5 404.54
		Affiliate Membership Scheme ^d	30 552.50
		UNESCO Contracts	7 000.00
			42 957.04
	926 901.19		
			926 901.19

Notes for Statement of General Income and Expenditure for Year ended 31 December 1985

- (a) Remaining from a special contribution from Draegerwerk.
- (b) The 83 022, written off, were taken from accumulated Bad Debts (116 125). With the addition of another 40 000, the provision was raised to 73 103 (*cf.* Balance Sheet) for future use.
- (c) CHEMRAWN accounting is done separately. The items entered in the IUPAC accounts are amounts placed with or withdrawn from the CHEMRAWN Rolling Fund. A separate statement of CHEMRAWN income and expenditures for the Rolling Fund will be presented in future.
- (d) Affiliate Membership Scheme expenditures are mainly based on non-budget money, raised separately for setting up the Scheme. A separate statement of AMS income and expenditures will be presented in future.
- (e) Division funds (allocated for 1984–85) to be used in 1985 (the amount not used in 1985 contributed to excess of income over expenditure).
- (f) Because of currency fluctuations there is a gain (or loss) with UK-pounds, Swiss-francs and German-marks relative to the US-dollar used for accounting.

Statement of Publications Income and Expenditure for Year ended 31 December 1985 (expressed in US-dollars)

[illegible]

Securities Account Statement as at 31 December 1985

	Approx. Price	Approx. Value, US-\$	Book Value at Cost, US-\$	Interest & Dividends, US-\$	Profit/Loss this Year, US-\$
Bonds					
7.50% Germany 20.4.89	102.50%	167 184	153 062.00	9 871.00	+ 38 417
11% BASF 1982-1.3.88	104.25%	104 250	99 721.39	10 835.00	+ 5 250
11.75% Nat. Westminster 1982-1.11.92	109.75%	109 750	99 230.17	11 573.75	+ 8 000
10.50% Bayer 1982-16.6.87 ex.	101%	252 500	248 016.88	25 856.25	+ 7 500
10.375% Citicorp 1983-11.5.90	104.875%	104 875	92 391.27	10 219.37	+ 10 875
15.75% Pacific Gas 1982-15.1.89	101.25%	50 625	50 096.29	7 756.87	- 1 375
9.625% Dow Chem. 1979-1.3.94	97%	58 200	52 276.63	5 688.37	+ 5 250
7.75% Volkswagen 1977-15.5.87	97.75%	39 100	40 254.98	3 053.50	+ 2 700
8.75% Olivetti 1985-15.4.93	98%	52 450	51 785.00	-1 866.74	+ 665
9% Philips 1985-30.5.93	102.375%	68 488	67 495.00	-3 000.44	+ 993
8.25% Beecham Int. Bermuda 1971-86	99.875%	23 970	24 500.16	3 575.55	+ 1 682
3.50% Yokogawa-Hokushin 12.3.90 Conv.				586.51	+ 2 643
2% Toshiba 1984-30.9.92 Conv.				139.51	- 1 590
5.25% Honda Motor 28.2.98 Conv.				641.67	+ 4 365
5.50% Daiwa Sec. 30.9.96 Conv.				557.64	+ 22
11.25% Morgan 1985-28.2.92	106.375%	106 375	99 165.70	-93.75	+ 7 209
11.375% Connecticut Savings 26.2.90	103%	61 800	60 560.17	-18.96	+ 1 240
Sub-total Bonds		1 999 567	1 138 555.64	85 375.10	+ 93 846
Shares					
shs Fidelity Magellan Fund	US-\$45.21	144 853	120 998.15	6 515.02	+ 37 135
Sub-total Shares		144 853	120 998.15	6 515.02	+ 37 135
Total		1 344 420	1 259 553.79	91 890.12	+ 130 981
Depreciation			30 000.00		
Depreciated Cost Price			1 229 553.79		

Conferences

Crystallography Congress

The 14th General Assembly of the International Union of Crystallography (IUCr) and the 14th International Congress of Crystallography will be held in Perth, Western Australia, at the University of Western Australia, 12–20 August 1987, under the sponsorship of the Society of Crystallographers in Australia and the Australian Academy of Science. Registration, the opening ceremony and the presentation of the first Ewald Prize (see *CI*, Vol. 8, No. 3, p. 2, 1986) will take place on Wednesday 12 August.

The scientific programme will include invited main lectures, invited oral papers and open commission meetings. Most contributed papers will be presented in poster sessions. Commercial and non-commercial apparatus will be exhibited and crystallographic data file demonstrations are planned. There will also be a book exhibition. The Congress will cover recent advances in all aspects of crystallography.

Photochemistry

The 7th International Symposium on the Photochemistry and Photophysics of Coordination Compounds will take place at Schloss Elmau, FRG, 29 March–2 April 1987.

The Royal Society of Chemistry Annual Congress at Swansea, UK, 14–16 April 1987 will include a Symposium on Inorganic Photochemistry.

Thiophene

A one day symposium on thiophene will be held on 6 May 1987 at the University of Salford under the auspices of The Heterocyclic Chemistry Group of

The Royal Society of Chemistry. Further information is available from The Conference Office, Maxwell Building, University of Salford M5 4WT, UK.

Scientific computing and automation

Europe's first conference and exhibition specifically for computing and automation in the sciences will be held in Amsterdam, The Netherlands at the RAI Congress Centre, 13–15 May 1987. Interdisciplinary and specialist sessions will be devoted to the latest advances in computing and automation in the scientific environment. These include chemistry (pharmaceutical, analytical, clinical, synthesis), the life sciences (clinical, microbiological) and engineering and technology (biotechnology, materials science, chemical technology, as well as applied geophysics). More information can be obtained from: Keith Foley, Elsevier Science Publishers, PO Box, 330, 1000 AH Amsterdam, The Netherlands.

Technological Education

An international conference on technological education entitled "Technology, Education and Society: Future Directions" will take place at Dallas Brooks Conference Centre, Melbourne, Australia from 10–15 May 1987. The themes of the conference will be (1) Technological developments and their impact on society; (2) The direction for tertiary education to the year 2000; and (3) The relationships between technology, industry and commerce, governments, education and the community. For further information contact: The Conference Chairman, Future Directions Conference, Royal Melbourne Institute of Technology, Box 2476V GPO, Melbourne, Victoria 3001, Australia.

IUPAC-Sponsored Conferences

International Symposium on Characterization of Porous Solids Bad Soden a.Ts., FRG, 26–29 April 1987

The symposium will be held at the Taunus Convention Centre Parkhotel and Kurhaus, Bad Soden.

The scientific programme will have a two-dimensional structure:

(A) Fundamentals and Methodology

Fundamentals

1. Classification of pore systems

2. Theories of pore filling mechanisms
3. Mathematical modelling of pore structure
4. Fractal analysis
5. Network and hysteresis effects
6. Percolation theory

Methodology

7. Adsorption

8. Porosimetry
9. Optical and electron microscopy
10. X-ray and neutron scattering
11. Calorimetry
12. Fluid permeation, etc.

(B) Porous Systems

1. Reference materials
2. Oxides and zeolites
3. Ceramics
4. Catalysts, supports, desiccants
5. Clays and soils

6. Carbons
7. Polymers
8. Structural materials, pigments, fillers, etc.

The language of the symposium will be English. Registration will cost about DM 400.00 and will include a welcome reception, drinks during the breaks and preprints/proceedings.

Bad Soden is a spa town, conveniently located in the Rhein–Main area, on the northwest outskirts of Frankfurt am Main, easily reached by public transport.

Conference Calendar

Conference circulars and registration forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in brackets.

1987

Porous Solids

26–29 April. International Symposium on Characterization of Porous Solids. Bad Soden, Nr. Frankfurt, FRG.
(Attn: Mrs C. Birkenberg, DECHEMA, PO Box 970146, D-6000 Frankfurt/Main 97, Federal Republic of Germany.)

Quantitative Luminescence Spectrometry

11–14 May. 2nd International Symposium on Quantitative Luminescence Spectrometry in Biomedical Sciences. Ghent, Belgium.
(Dr Willy R. G. Baeyens, Laboratory of Pharmaceutical Chemistry and Drug Quality Control, Faculty of Pharmaceutical Sciences, State University of Ghent, Harelbekestraat 72, B-9000 Ghent, Belgium.)

CHEMRAWN VI

17–22 May. CHEMRAWN VI. World Conference on Advanced Materials Needed for Innovations — Energy, Transportation and Communications. Tokyo, Japan.

(CHEMRAWN VI Coordinating Office, The Chemical Society of Japan, 1-5 Kanda-Surugadai, Chiyoda-ku, Tokyo 101, Japan.)

Free-Radical Polymerization

17–23 May. International Symposium on Free-Radical Polymerization: Kinetics and Mechanisms. Santa Margherita Ligure, Nr. Genoa, Italy.
(Prof. Savgerio Russo, C.N.R. Center on Macromolecules, Corso Europa 30, I-16132 Genoa, Italy.)

Organosilicon Chemistry

7–12 June. 8th International Symposium on Organosilicon Chemistry. St Louis, Missouri, USA.
(Prof. Peter P. Gaspar, Department of Chemistry, Washington University, St Louis, Missouri 63130, USA.)

Pollutants in Porous Media

14–19 June. 2nd International Workshop on Behaviour of Pollutants in Porous Media. Bet Dagan, Israel.
(Dr Zev Cerstl, Institute of Soils and Water, Volcani Center, ARO, PO Box 6, Bet Dagan 50–520, Israel.)

Boron Chemistry

22–26 June. 6th International Conference on Boron Chemistry. Bechyne, near Tabor, Czechoslovakia.
(Dr S. Hermanek, Institute of Inorganic Chemistry, Czechoslovak Academy of Sciences, 250 68 Rez near Prague, Czechoslovakia.)

Macromolecules

30 June–4 July. 31st International Symposium on Macromolecules. Merseburg, GDR.
(Technische Hochschule "Carl Schorlemmer", Leuna-Merseburg, Macro 87, Otto-Nuschke-Strasse, DDR-4200 Merseburg, German Democratic Republic.)

Macromolecules

6–9 July. 30th Microsymposium on Macromolecules. Polymer-Supported Organic Reagents and Catalysts. Prague, Czechoslovakia.
(Dr P. Cefelín, Scientific Secretary, P.M.M. Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovského náměstí 2, CS-16206 Prague 6-Petriny, Czechoslovakia.)

Bioinorganic Chemistry

6–10 July. 3rd International Conference on Bioinorganic Chemistry. Noordwijkerhout, The Netherlands.

(Prof. J. Reedijk, State University Leiden, Gorleaus Laboratories, PO Box 9502, NL-2300 RA Leiden, The Netherlands.)

Macromolecules

13–16 July. 10th Discussion Conference on Macromolecules. Small-angle Scattering and Related Methods. Prague, Czechoslovakia

(Dr P. Cefelín, Scientific Secretary, P.M.M. Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovského náměstí 2, CS-16206 Prague 6-Petriny, Czechoslovakia.)

IUPAC Congress

13–18 July. 31st International Congress of Pure and Applied Chemistry. Sofia, Bulgaria. (31st International Congress of Pure & Applied Chemistry, Centre of Chemistry, Bulgarian Academy of Sciences, Acad. G. Bonchev Str., Block 11, 1113 Sofia, Bulgaria.)

Heteroatom Chemistry

19–24 July. International Conference on Heteroatom Chemistry (ICHAC-1987). Kobe, Japan
(Prof. Michio Kobayashi, Secretary, ICHAC-1987, c/o Kinki Chemical Society, 1-8-4, Utsubo-Honmachi, Nishiku, Osaka 550, Japan.)

Macrocyclic Chemistry

20–23 July. 12th International Symposium on Macrocyclic Chemistry. Hiroshima, Japan

Reduced conference fees for Affiliates

Organizers of the following conferences have agreed to a 10 per cent reduction in Conference fees for Affiliates:

- International Symposium on Characterization of Porous Solids (Bad Soden, Nr. Frankfurt, FRG, 26–29 April 1987)
- 2nd International Symposium on Quantitative Luminescence Spectroscopy in Biomedical Sciences (Ghent, Belgium, 11–14 May 1987)
- 2nd International Workshop on Behavior of Pollutants in Porous Media (Bet Dagan, Israel, 14–19 June 1987)
- 6th International Meeting on Boron Chemistry (Bechyne, Czechoslovakia, 22–26 June 1987)
- 31st International Symposium on Macromolecules (Merseburg, GDR, 30 June–4 July 1987)
- International Conference on Heteroatom Chemistry (ICHAC-1987) (Kobe, Japan, 19–24 July 1987)
- 9th International Conference on Chemical Education. Sub-title: 'Chemistry for our New World' (São Paulo, Brazil, 26–31 July 1987)
- 25th International Conference on Coordination Chemistry (Nanjing, China, 26–31 July 1987)
- 8th International Conference on Solute–Solute–Solvent Interactions (Regensburg, FRG, 9–14 August 1987).
- 2nd Nordic Symposium on Trace Elements in Human Health & Disease (Odense, Denmark, 17–21 August 1987)

(Prof. Eiichi Kimura, Institute of Pharmaceutical Sciences, Hiroshima University School of Medicine, Kasumi 1-2-3, Hiroshima 734, Japan.)

Organometallic Chemistry

26–30 July. 4th International Symposium on Organometallic Chemistry Directed Towards Organic Synthesis (OMCOS IV). Vancouver, B.C., Canada.
(Prof. Michael D. Fryzuk, Department of Chemistry, The University of British Columbia, 2036 Main Hall, Vancouver, British Columbia, Canada V6T 1Y6.)

Chemical Education

26–31 July. 9th International Conference on Chemical Education. 'Chemistry for our New World'. São Paulo, Brazil.
(Prof. Ernesto Giesbrecht, Instituto de Química, Universidade de São Paulo,

Caixa Postal 20.780, 01498 — São Paulo, SP, Brazil.)

Coordination Chemistry

26–31 July. 25th International Conference on Coordination Chemistry. Nanjing, China.
(Prof. Xiao-Zeng You, Conference Secretary, XXV ICC, Coordination Chemistry Institute, Nanjing University, Nanjing, Jiansu Province, China.)

Solute–Solute–Solvent Interactions

9–14 August. 8th International Conference on Solute–Solute–Solvent Interactions. Regensburg, Federal Republic of Germany.
(Prof. J. M. G. Barthel, Institut für Physikalische und Theoretische Chemie, Universität Regensburg, Universitätstrasse 31, D-8400 Regensburg, Federal Republic of Germany.)

Theoretical Organic Chemistry

12–19 August. World Congress of Theoretical Organic Chemists. Budapest, Hungary. (E. A. Lang, WATOC CONGRESS, Hungarian Chemical Society, H-1061 Budapest, Anker Kőz 1, Hungary.)

Trace Elements

17–21 August. 2nd Nordic Symposium on Trace Elements in Human Health and Disease. Odense, Denmark. (Prof. Philippe Grandjean, Department of Environmental Medicine, Institute of Community Health, Odense University, J. B. Winslows Vej 19, DK-5000 Odense C, Denmark.)

Fourier Transform Spectroscopy

24–28 August. 6th International Conference on Fourier Transform Spectroscopy. Vienna, Austria. (6th FTS Conference 1987, c/o Interconvention, PO Box 80, A-1107 Vienna, Austria.)

Cationic Polymerization

24–28 August. 8th International Symposium on Cationic Polymerization and Related Processes. Munich, FRG. (Prof. Oskar Nuyken, Institut für Organische Chemie, Johannes Gutenberg-Universität Mainz, Postfach 3980, J. J. Becher-Weg 18–20, D-6500 Mainz, Federal Republic of Germany.)

Plasma Chemistry

31 August–4 September. 8th International Symposium on Plasma Chemistry. Tokyo, Japan. (Prof. Kazuo Akashi, Dept. of Metallurgy & Materials Science, Faculty of

Engineering, The University of Tokyo, 7-3-1, Hongo, Bunkyo-ku, Tokyo 113, Japan.)

CHEMRAWN IV

4–8 October. "Modern Chemistry and Chemical Technology Applied to the Ocean and its Resources." Colorado, USA. (Dr Derek W. Spencer, Associate Director for Research, Woods Hole Oceanographic Institution, Woods Hole, MA 02543, USA.)

1988

Natural Products

29 May–4 June. 16th International Symposium on the Chemistry of Natural Products. Kyoto, Japan. (Prof. Isao Kitagawa, General Secretary, 16th International Symposium on the Chemistry of Natural Products, c/o The Chemical Society of Japan, 1-5, Kanda-Surugadai, Chiyoda-ku, Tokyo 101, Japan.)

Organic Synthesis

4–7 July. 7th International Conference on Organic Synthesis. Nancy, France. (Prof. P. Caubere, Université Nancy 1 — Faculté des Sciences, Laboratoire de Chimie Organique 1, BP 239, 54506 Vandoeuvre-les-Nancy Cédex, France.)

Macromolecules

11–14 July. 11th Discussion Conference on Macromolecules: Chemical and Physical Phenomena in the Ageing of Polymers. Prague, Czechoslovakia. (Dr. P. Cefelín, Scientific Secretary, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, CS-16206 Prague 6-Petriny, Czechoslovakia.)

Macromolecules

1–6 August. 32nd International Symposium on Macromolecules. Kyoto, Japan. (Prof. Takeo Saegusa, Department of Synthetic Chemistry, Faculty of Engineering, Kyoto University, Yoshida-machi, Sakyo-ku, Kyoto, 606 Japan.)

Mycotoxins and Phycotoxins

16–19 August. 7th International Symposium on Mycotoxins and Phycotoxins. Tokyo, Japan. (Prof. Shinsaku Natori, Maiji College of Pharmacy, 1-22-1, Yatocho, Tanashi-shi, Tokyo 188, Japan.)

Chemical Thermodynamics

29 August–2 September. 10th Conference on Chemical Thermodynamics. Prague, Czechoslovakia. (Prof. R. Holub, Department of Physical Chemistry, Institute of Chemical Technology, 166 28 Prague 6, Czechoslovakia.)

1990

Organic Synthesis

June. 8th International Conference on Organic Synthesis. Helsinki, Finland. (Prof. Tapio Hase, Department of Chemistry, University of Helsinki, Vuorikatu 20, SF-00100 Helsinki, Finland.)

Pesticide Chemistry

5–11 August. 7th International Congress of Pesticide Chemistry. Hamburg, FRG. (Gesellschaft Deutscher Chemiker, Abt. Tagungen, PO Box 90 04 40, D-600 Frankfurt/Main 90, Federal Republic of Germany.)

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Widening the Scope of Chemistry



IUPAC

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Scientific Publications

Edited by **Y. Takeuchi**,
Professor, Department of Chemistry,
University of Tokyo.

Plenary and invited lectures presented at the 8th International Conference on Chemical Education held at Tokyo in August 1985 are contained in this volume. The conference was organized by IUPAC in conjunction with the Chemical Society of Japan and featured contributions from an international group of experts.

Outline of Contents:

Preface; Chemical education and its surroundings; Chemical education in computer age; Steps towards achieving the computer's potential; Some examples of the use of Artificial Intelligence techniques in chemical education; Chemical education for fostering future chemists of excellence; Lessons from the past and prospects for the future of chemical education in Brazil; The teacher as the key to excellence in chemistry; The role of chemistry in a biological education; Education of chemists for future break-throughs in medical sciences; An approach to chemical education from the biological point of view; What does industry expect from an education in chemistry?; The teaching of industrial chemistry — widening the scope of high school chemistry; Linking chemical education to industry — Korean experiences; Chemistry education for everyone; Report on the Small Group discussions.

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Physical Chemistry of Colloids and Macromolecules

Edited by **Bengt Rånby**

Royal Institute of Technology, Stockholm, Sweden



Proceedings of the *International Symposium on Physical Chemistry of Colloids and Macromolecules* to celebrate the 100th birthday of **Professor The (odor) Svedberg**, pioneer of colloid and macromolecular research, Uppsala University, Sweden 1984.

The Symposium Volume contains the main addresses and invited lectures describing the intense and successful work of a great scientist in a wide area. Retrospective lectures follow Svedberg's shift in interest from inorganic colloids to proteins and other macromolecules and, finally, to nuclear and radiation research.

The main lectures invited describe current research in the 'Svedberg areas'. They reflect the importance of Svedberg's pioneering research on colloids and macromolecules. The development of ultracentrifugal sedimentation, and other preparative and analytical methods for protein which followed, has made Uppsala a leading research center in the field of protein analysis.

Svedberg's broad interests in research covered a wide field in physics, chemistry, biology and technology-and a life-long devotion to botany as described by Professor Sven Brohult in his general lecture on 'Svedberg as a Scientist'.

The Symposium was attended by 220 scientists, of whom 100 were from abroad, representing 17 countries.

Outline of Contents:

Introductory lectures; Retrospective lectures on Svedberg's contributions; Colloid and surface science; Sedimentation analysis of macromolecules; Macromolecular solutions and gels; The Svedberg-a man of many interests and talents; The Svedberg's views on science, technology and society.

Late 1986. 162 pages, 76 illustrations. About £20.00 ISBN 0632 01536 5

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Proceedings of the Sixth International Congress of Pesticide Chemistry

Edited by **R. Greenhalgh**, BSc(Hons), PhD, Chemistry and Biology Research Institute, Agriculture Canada, Ottawa

This report on the **Sixth International Congress of Pesticide Chemistry** held August 10th-17th 1986, in Ottawa, Canada, under the auspices of the International Union of Pure and Applied Chemistry (IUPAC) constitutes a comprehensive review of the current understanding of this topical subject. The major theme of the conference was the use of biotechnology to provide new approaches to pest control and the published proceedings contains such subjects as synthesis, mode of action, analysis of residue and environmental factors. The book will therefore prove to be a useful reference for researchers and chemists in the agrochemical industry, pesticide science, weed research and biotechnology.

Outline of Contents:

Synthesis of pesticides and bioregulators; Chemistry and bioactivity of natural products and prototypes; Chemical and biological basis of pesticide activity and resistance; Progress and development in formulation chemistry and technology; Pesticide residue methodology; Environmental fates and effects; Metabolism in plants and animals; Pesticide toxicology and human health.

Early 1987. About 640 pages, 200 illustrations. Cloth, about £50.00 ISBN 0 632 01618 3

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Heat Conduction

J.M. Hill, PhD, and **J.N. Dewynne**, PhD, both of the Department of Mathematics, University of Wollongong, New South Wales, Australia.

One of the most important partial differential equations in applied mathematics is the heat or diffusion equation. Its importance in the modelling of heat conduction, diffusional processes and flow through a porous medium is well known. It arises from a probabilistic framework and emerges as the simplest approximation to bulk processes governed at the microscopic level by random spatial variations. The book is intended as a modern undergraduate text which reflects the importance of the heat equation in applied mathematics and mathematics modelling. Familiarity with the heat equation is essential for aspiring mathematical modellers, and this book is intended to support an advanced undergraduate course in applied mathematics, science or engineering. To provide a balanced account of solutions and results for the heat equation, the authors have adopted the strategy of bringing together the simplest and most useful results from many diverse areas of mathematics. More complicated results are summarized as problems at the end of each chapter.

Outline of Contents

Introduction; Mathematical preliminaries; Exact analytical solutions for semi-infinite media; Exact analytical solutions by Fourier series; Approximate analytical solutions by heat-balance; Numerical solutions; Melting or freezing moving boundary problems; Table of Laplace transforms.

Spring 1987. About 320 pages, 45 illustrations. Paper, about £16.00 ISBN 0 632 01716 3

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Analytical Chemistry in the Exploration, Mining and Processing of Minerals

Edited by **L.R.P. Butler**

Analytical chemistry is extremely important for the mineral industry, as it is a research method used not only in the exploration and exploitation of mineral deposits, but also in the processing of materials. This volume contains the invited lectures presented at the *2nd International Symposium on Analytical Chemistry in the Exploration, Mining and Processing of Materials* which was held in South Africa in 1985. The aim of the symposium was to highlight the importance of analytical chemistry in the production of materials, such as coal, ferrous and non-ferrous metals, ceramics and precious metals, from the initial stages of exploration and assessment of ores to their beneficiation and, finally, to the refined product. This volume will be equally valuable to anyone working in fields related to the quality of materials, such as analytical chemists, mineral physicists, metallurgists, geologists, and chemical and mining engineers.

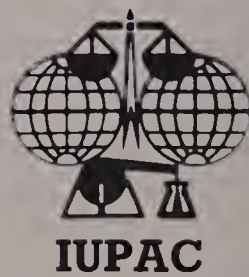
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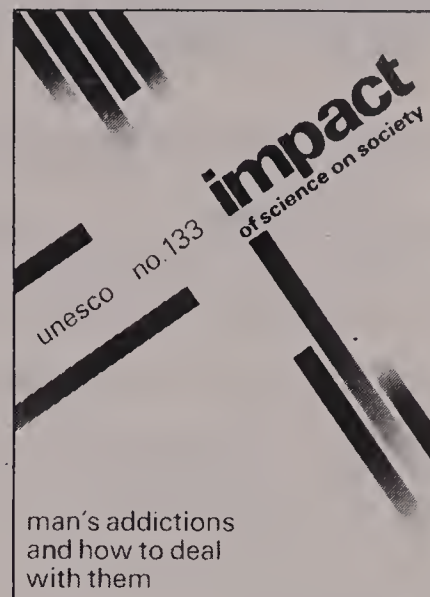
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IMPACT

of science on society

EDITOR

David Spurgeon
UNESCO



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The worldwide attempts of synthetic organic chemists to open up new territories and to reclaim the long neglected ones were highlighted at the 5th IUPAC International Symposium on Organic Synthesis held in Freiburg i. Br. (FRG) on 27-30 August 1984. To pursue the increasingly interdisciplinary goals and activities, the Symposium Organizing Committee stressed emphasis on the following four main themes:

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- to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
- to co-operate with other international organizations which deal with topics of a chemical nature;
- to contribute to the advancement of pure and applied chemistry in all its aspects.

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